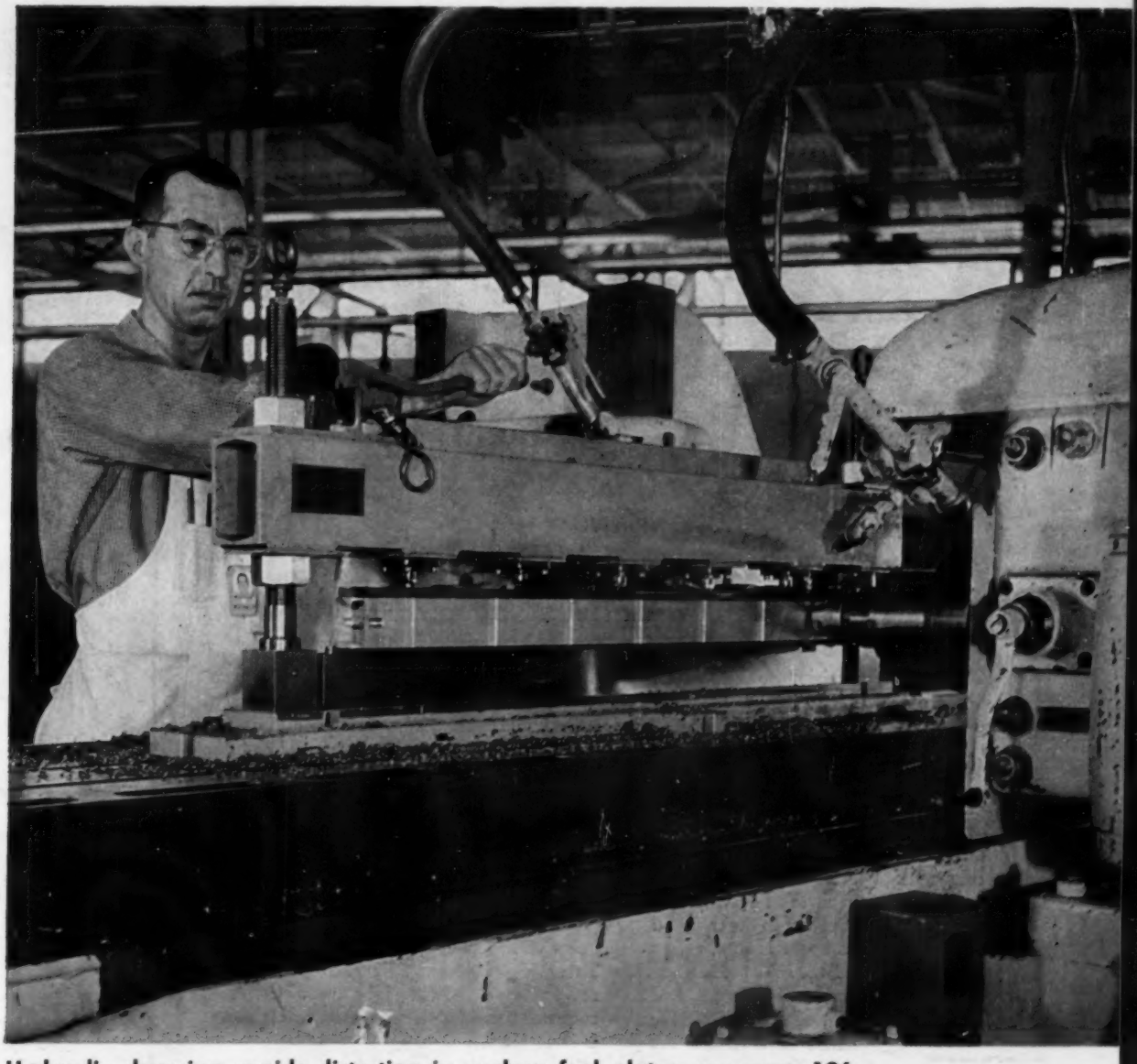
FEBRUARY 8, 1960

American Machinist / Metalworking Manufacturing

A McGraw-Hill Publication • Seventy-Five Cents



Hydraulic clamping avoids distortion in nuclear fuel plates—see page 106

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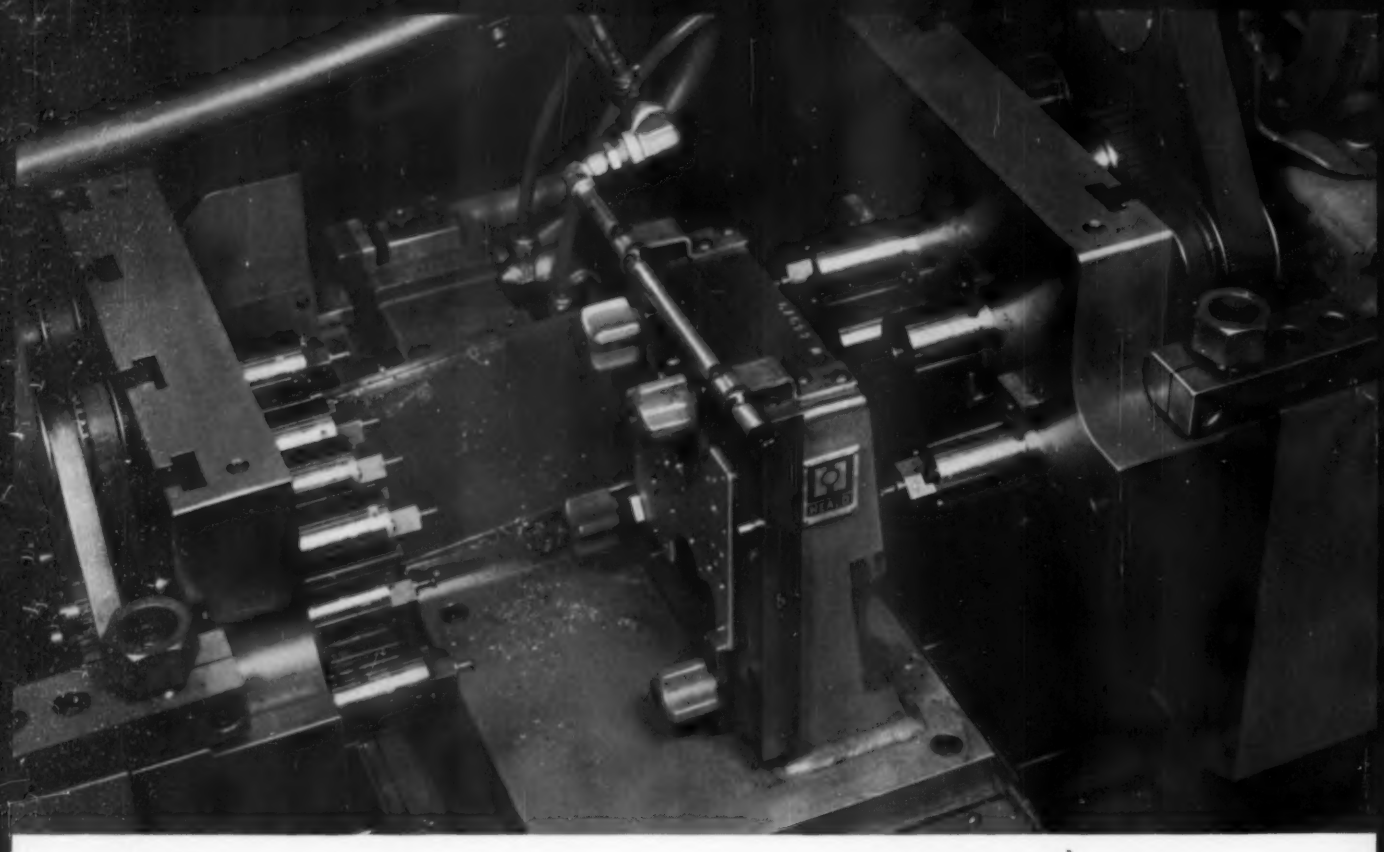


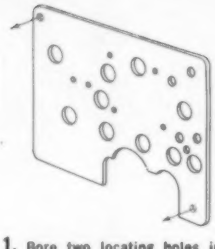
Bore 23 holes on 1 machine

Heald Model O Bore-Matic solves multiple-hole Borizing problem with interchangeable Multi-Spindle Heads

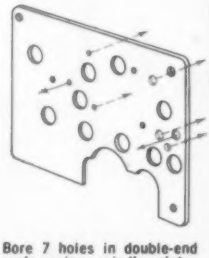
The Problem—to precision bore 23 holes, ranging from .0365" to .3570" in diameter, in medium-hard aluminum gear-box plates, with a tolerance of .0005" on diameter and .0009" on centers—also to bore 12 similar holes in a matching plate.

The Solution—a Heald double-end Model O Bore-Matic equipped with two sets of interchangeable Multi-Spindle boringheads. As shown in the drawings at the right, the 23-hole plate is precision Borized to the required tolerances in only three operations, using an indexing cross-slide and with all holes accurately positioned by cross-slide index and spindle location. One set of Multi-Spindle heads is used for the first two operations—then spindle plates are changed for the final operation. The second set of spindle plates also finishes all bores in the 12-hole plate in two operations. Average production is 10 parts per hour.

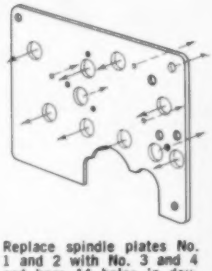
Heald Multi-Spindle boringheads consist of interchangeable spindle plates, precision bored to mount the desired number of miniature Red-Head boringheads which are belt-driven from a single motor. This arrangement permits simultaneous Borizing of multiple holes with center distances as close as ¾". To save production time and cost on your multiple-hole borizing jobs, ask your Heald engineer for complete information on Model O Bore-Matics.



1. Bore two locating holes in single-end cycle using spindle plate No. 1.



2. Bore 7 holes in double-end cycle using spindle plates No. 1 and 2.



3. Replace spindle plates No. 1 and 2 with No. 3 and 4 and bore 14 holes in double-end cycle.

(Arrows show direction of table travel for holes indicated)

HEALD®

MMT=pE

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THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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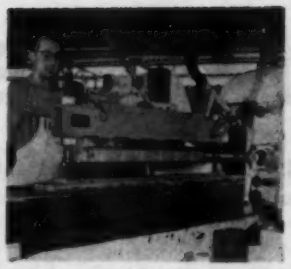
CIRCLE 151 READER SERVICE CARD

COVER:

Bridge fixture at M & C Nuclear, Inc, clamps fragile nuclear fuel plates for duplex milling. All clamps are hydraulically powered simultaneously. *See p 106.*



American Machinist / *Metalworking Manufacturing*

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TURN PAGE FOR METALWORKING REPORT→

METALWORKING REPORT

Significant current developments in tooling and production processes

CUTTING

360,000 SFPM!

Tool wear drops off at extremely high cutting speeds. This is believed to be one of the conclusions of a Lockheed Aircraft report being made to the Air Force as a result of research into ultra-high-speed machining. Tests have been made by firing workpieces from a 20-mm gun past an instrumented HSS toolbit, and by utilizing a rocket sled at Edwards Air Force Base.

Speeds have ranged from 15,000 to 360,000 sfpm. Among unexpected results is a shear angle less than 45°, resulting in chip thickness less than the depth of cut (just the reverse of experience in conventional machining).

The Manufacturing Methods division at Wright-Patterson Air Force Base has been reviewing the Lockheed report, and can be expected to release detailed results on the tests in the near future.

FORMING

Quick Trim

High-speed rolling, forming, and trimming—as fast as 2000 pc/hr—is possible on new sheet-metal equipment announced by Maemmerle A G, Zofingen, Switzerland. Forming and cutting tools that produce such parts as lamp sockets, boxes, and dished heads are carried on fixed or movable shafts that operate the circular tools much like a can opener. Copying is done, usually on a horizontal version of the machine, with a movable shaft that brings a circular tool down against the work, which is held over a hardened steel form block. Air-cylinder pressure causes the work ID to follow the form, producing up to a 40-in.-diagonal box. Parts with a diagonal measure up to 9 in. are formed and trimmed on vertical machines that also do piercing and embossing in an axial direction. Additional heads can be added for supplementary operations, and transfer mechanisms can be attached for automatic feed.

Springback Killer

Stretching and forming are combined at Chance-Vought, Dallas, to eliminate springback in airframe members up to 16 ft long. Work is done on a Pacific hydraulic press brake fitted with stretching cylinders attached to the ends of the work. Forming pressure is up to 750 tons, applied with work on the 20-ft bed of the machine.

INSPECTION

N/C Gaging

Faster and more accurate gaging for rocket-engine impellors and other complex parts is now being handled at Rocketdyne, Canoga, Calif, by numerically controlled equipment accurate to 10 millionths. The Warner & Swasey electric measuring machine is built up from a Moore jig borer with a special work-indexing head on the table and a Probograf in the spindle position. A workpiece with corkscrew shape is mounted, rotated to present a particular spot to the probe head, then moved toward the head. At the instant of contact, the Probograph records a dot on wide graph tape, which can be analyzed for errors in thickness, contour, twist, and bow. Machine motion is controlled by standard 1-in. 8-channel paper tape, on which all motions of the head and machine are set up ahead of time. The equipment reduces inspection time as much as 90%.

HEAT TREATING

Yield = Tensile

Yield strength has been brought up to tensile strength on a variety of steels and some titanium alloys, without loss of ductility, by means of the new heat-treating process originated by William I Bassett, III, of Research Development Corp of America (AM—Nov 2 '59, p2). Good results have also been reported in preliminary work on tungsten, copper, and aluminum alloys. Bassett thinks the process can also be applied to exotic alloys containing beryllium, boron, and nitrogen Though most of the details of the process are still secret, it is known that a magentic field is applied to line up the metal grains, and that grains are of equal size, averaging about 1/10 as large as in conventionally treated metals. The process increases ductility at the same time.

WELDING

Higher Duty Cycles

Resistance-welding transformers can operate at higher temperatures when they are insulated with epoxy resin, according to Kirkho Manufacturing Corp, Grand Rapids, Mich.

In introducing its new line of transformers, the company states that the temperature limits have been boosted to 155 C. This, in turn, allows an increase of 25% in duty cycles and a longer life expectancy.

THE OUTLOOK

Metalworking's climb toward new production peaks should continue now that steel deliveries are getting back to normal. By April of this year distributors' inventories of industrial steel products are expected to be back to desired levels, with the exception of sheet mill products, and these should be in full supply by June. (See pages 93, 95.)

The units will have epoxy-insulated secondary loops. As a safety feature, the same material will coat all exterior surfaces except the terminals.

Kirkhof claims a breakthrough in epoxy application—says the material couldn't be used in transformer production before now because of difficulties in controlling the rate at which it sets up. However, with the new techniques, the company says it can get the insulation all the way into the copper secondaries. One great advantage is that the epoxy is said to get stronger with age.

ASSEMBLY

Self-Broaching Fastener

Douglas Aircraft has originated, and Huck is now producing, a self-broaching, close-tolerance fastener that was first applied on the Thor missile. The fastener has integral broaching teeth that finish a predrilled undersize hole as the fastener is inserted. This provides closer fit between fastener and hole, and prevents leaks through the bulkhead of the LOX compartment. The broaching is done dry to eliminate any chance of reaction between lubricant and the liquid oxygen. Precision fit with the fastener is held within ±0.00075 in.

FINISHING

Epoxy Lacquers

Tough, transparent decorative lacquers developed by Swale Chemicals, Croyden, England, are based on epoxy, and are capable of being dipped and sprayed with conventional equipment. Aluminum coated with the material may be blanked,

An Announcement

Effective with this issue, AMERICAN MACHINIST becomes AMERICAN MACHINIST/METALWORKING MANUFACTURING.

This step, incorporating the sub-title, *The Magazine of Metalworking Manufacturing*, into the main title, recognizes certain self-evident facts.

For many years the name AMERICAN MACHINIST has been a misnomer. It is not descriptive of the editorial content. The magazine is edited for men who comprise manufacturing management at all levels in the metalworking industry or who want to inform and educate themselves so they may become a part of manufacturing management. It is *not* edited for the man at the machine.

When AMERICAN MACHINIST was founded more than 82 years ago, in 1877, the name *was* descriptive. More often than not, in the small shops which then constituted most of metalworking, the machinist (the man who operated the machine) also owned the business. An example was Henry Ford who became a subscriber to AMERICAN MACHINIST before the turn of the century. For over half a century AMERICAN MACHINIST has dealt with the technology of metalworking manufacturing at the management and engineering level. It offers little to the man at the machine unless he is ambitious to qualify for a supervisory position.

AMERICAN MACHINIST is, and has been for many years, the magazine of metalworking manufacturing. The change in name is recognition of that fact and nothing more. Editorial policy and editorial content will not change. The new name will describe more accurately what you, the reader, can continue to expect from our editors: the most up-to-date, authoritative reporting on the newest manufacturing and management techniques in the metalworking industry. We will continue to give you the latest developments in production processes from machining, forming, heat treating, and inspection to materials handling, welding, assembly, and finishing. We will continue to keep you informed on the newest equipment, supplies, materials, and parts you must know about to make your manufacturing operation efficient. And we will continue to provide you with the important news and business trends in metalworking on a timely, reliable basis to help you make sound business judgments.

Whether you have top manufacturing responsibility, are engaged in manufacturing engineering or are a part of plant or shop management, AMERICAN MACHINIST/METALWORKING MANUFACTURING will keep right on bringing to you up-to-the-minute information on: 1) all the manufacturing processes in metalworking, 2) the manufacturing planning and engineering involved therein, and 3) the latest techniques of management or manufacturing control to help you manufacture your product with maximum efficiency, in minimum time, at lowest practical cost.

We renew our assurance that, if you read every issue of AMERICAN MACHINIST/METALWORKING MANUFACTURING, you will not miss anything of importance that happens in metalworking.

George Reppert

Publisher

formed, and pierced; and can be made into kitchen and light-industrial equipment with high scuff resistance and light-fast qualities. The lacquer is claimed to compare favorably with electrochemical finishes. Articles subject to detergents for long periods should be lightly coated with quick-dry size before lacquering. Standard colors are red, blue, green, gold, brass, and copper; others can be matched on request.

MATERIALS HANDLING

Automatic Pipe Handling

Giant steel pipe is automatically conveyed to and positioned in any of five welding stations in a new setup. When an operator needs a pipe, he merely presses his "call" button, and the pipe automatically advances to his station.

The steel pipe is held either in the conveyor or in a waiting station before each conveyor station. Positions of pipe and operation of the pipe manipulators are detected by Cypak proximity switches, which detect the presence of the pipe by changes in reluctance in their magentic fields. System was designed by Westinghouse for the Consolidated Western Steel Co (Provo, Utah), which makes steel pipe for the oil industry.

Providing waiting stations before each conveyor station doubles the storage capacity of the area, makes pipe available at all times without need for reversal of the pipe-handling equipment.

When a weld is completed, the operator presses a control button to discharge the pipe from his station. The Cypak system then takes over, automatically gathering the pipe from the parallel-flow welding stations and transferring it to the pipe conveyor. The pipe then automatically is directed through a flux-recovery station and finally to an inspection station.

MATERIALS & COMPONENTS

Long Tantalum Tubes

Seamless tantalum tubing in lengths up to 60 ft has been produced by Calumet & Hecla's Wolverine Tube Div. First major user of this long-length tubing will be Iowa State Univeristy's Institute for Atomic Research for construction of molten metal test loops. Tubing is made by extruding tantalum through a die using new techniques developed in Wolverine's R&D facility, which was opened about two years ago. Size range for tantalum tubing is 0.453 in. to 1.5 in. outside diameter, with wall thicknesses from 0.015 in. to 0.125 in., in lengths up to 60 ft.

RTV Silicone Rubber

Three new paste curing agents developed by General Electric's Silicone Products Dept have improved and simplified the preparation of RTV (room-temperature vulcanizing) silicone rubber. The pastes, identified as RTV-992, RTV-993, and RTV-994, offer a dilute form of the earlier liquid curing agent. As a result, it is much easier to measure and weight this catalyst. Moreover, the addition of color to the paste, in contrast to the color in the RTV compounds, helps assure thorough mixing and complete dispersion. Depending upon the percentage of curing agent used and the particular RTV compound, pot life and tack-free time can be controlled from 15 and 30 min, respectively, to several days. RTV liquid silicone rubber, used in sealing, potting and encapsulating electronic, instrument and similar components, cures at room temperature.

MANUFACTURING CONTROL

Fenceless Press Safety

A sensing element, or antenna, replaces the usual guard or fence in a new press-safety device marketed by Security Controls, Buffalo, N Y. The antenna is part of an electronic circuit that is affected when a hand, or even a tool or any other undesired object enters the press danger zone. The device prevents press action until the object is removed. Control is through a relay in the electronics cabinet of the device (evidently it works on a variation of the capacitance switch), which will also prevent press action in case of power failure, disconnection, or faulty operation of the safety device itself. The antenna can be adapted in shape to any press or other machine, and is supported by insulating mounts. Installations can be handled by any plant electrician.

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.

American Machinist/Metalworking Manufacturing, published bi-weekly by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder.

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Subscriptions are solicited only from manufacturing executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

United States subscription rate for individuals in the field of the publication $3.00 per year, single copies 75 cents, Canada $4.00 per year, foreign $25.00 per year, payable in advance. Second-class postage paid at New York, N. Y. Printed in U. S. A.

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Cincinnati High Power and Dual Power Dial Types

make quick work of heavy duty milling

High volume stock removal reduces cost to a bare minimum. Especially is this true of heavy duty milling operations, the kind of work that's easy for CINCINNATI High Power and Dual Power Dial Types. The smallest Dual Power (28" table travel) is built and equipped for 20 hp milling. The largest handles 50 hp work! This means extra fast metal removal and extra low costs.

Operators prefer these machines because they're so easy to run. Just consider the method of changing speeds and feeds, a chore which must be repeated dozens of times every day for some types of setups. Cincinnati operators select speeds and feeds by *power*, with a single lever at the front and duplicate levers at the rear.

The High Power and Dual Power line includes plain, universal and vertical styles, totaling 40 size and style combinations. All conform to a high degree of dependable performance, a product of Cincinnati's integration from the metallurgy of cast iron to follow-up service after shipping. The next two pages contain more facts which can help your shop break the cost barrier of heavy duty milling. Get complete information by writing for catalog No. M-1917-5. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES
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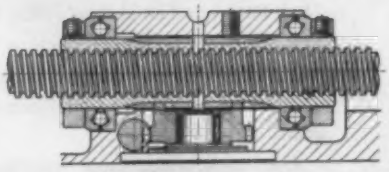
You'll be proud of your choice . . .

Cincinnati High Power

HEAVY DUTY MILLING is clearly evident in this setup on a CINCINNATI 50 hp Dual Power Dial Type. Top and slot are milled in two tables at one time.



AUTOMATIC BACKLASH ELIMINATOR, an exclusive standard feature on Cincinnati, assures uniformly smooth table feed for both up-milling and down-milling.

CINCINNATI

BUILDERS OF FINE MACHINE TOOLS: KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES •

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and Dual Power Dial Types

are tops for heavy duty milling

It's a good feeling to know that you have purchased the finest equipment available for your requirements. Whatever they are in the area of milling, Cincinnati is the best buy. Here are a few profit pointers on the High Power and Dual Power Dial Type line:

Extra sturdy construction throughout, including Dynapoise overarm and deep, square gibbed ways that resist twist.

Equipped for variety work and automatic cycle milling (plain and vertical styles).

Arbor-Loc spindle nose, an exclusive feature-advantage for jobs requiring quick change of cutters.

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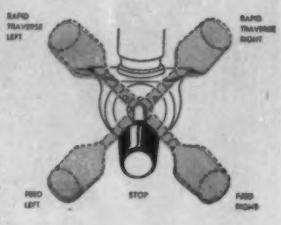
Twenty-four spindle speeds and thirty-two feed rates; ample for any cutter or work material.

No other heavy duty milling machine provides so many feature-advantages plus the dependable productivity of a Cincinnati. Get complete information by writing or telephoning for a copy of catalog No. M-1917-5.



SINGLE LEVER TABLE CONTROL, an operating and setup advantage originated decades ago by Cincinnati.

ONE LEVER POWER SELECTION of spindle speeds and feed rates is another exclusive Cincinnati advantage.

AUTOMATIC CYCLE MILLING is truly automatic on a Cincinnati. It includes automatic reverse out of feed, and center safety stop.

CINCINNATI Plain High Power Dial Type Milling Machine. The complete Cincinnati line includes 40 size, style and power ratings. Catalog No. M-1917-5.

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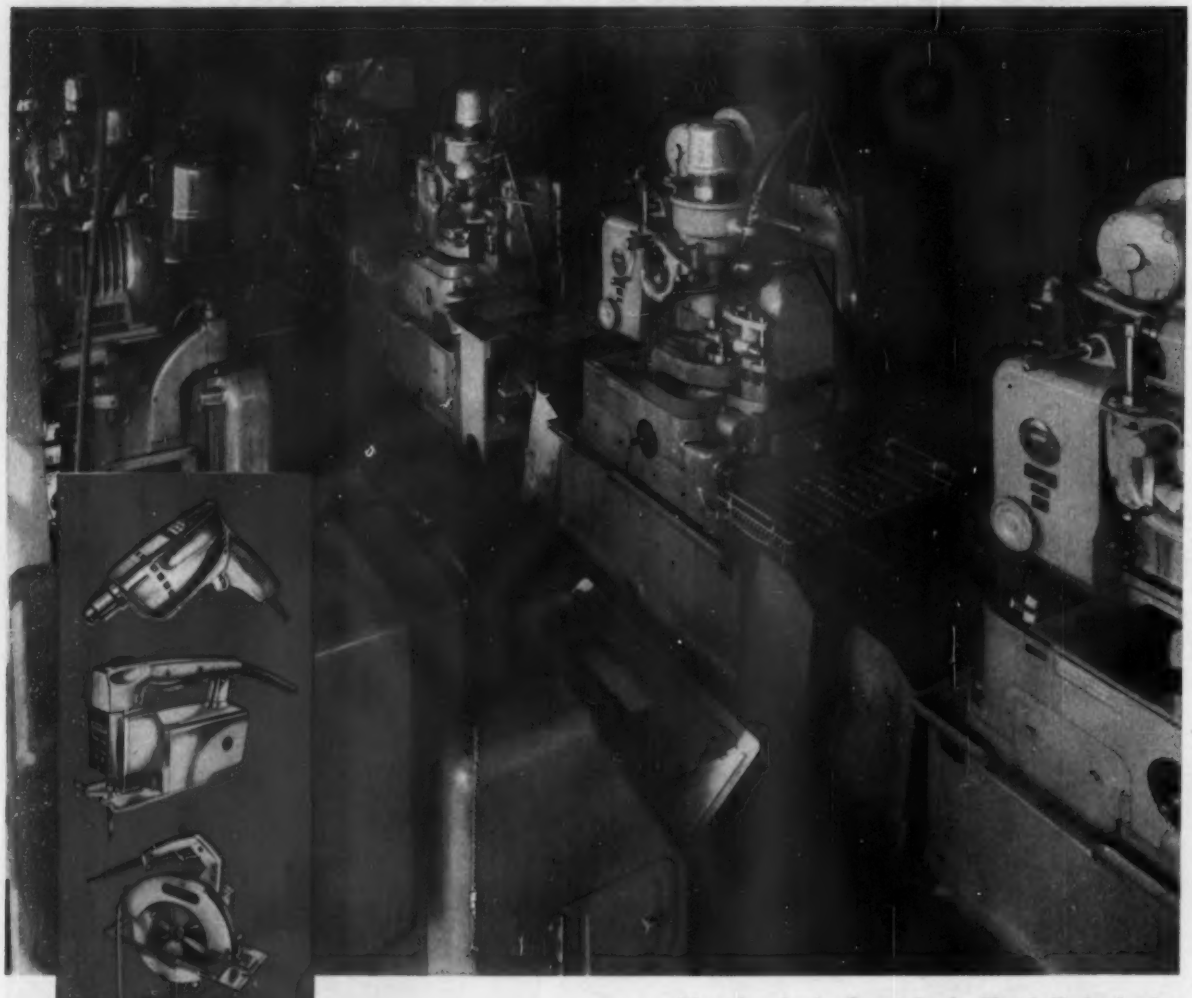
FELLOWS GEAR PRODUCTION Builds Extra Quality



View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.

Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE PRECISION LINE

Fellows

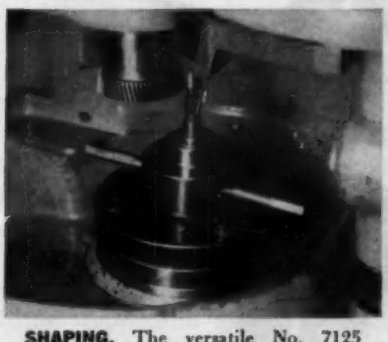
EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

Fellows has long been the leader in Gear Production Equipment, with machines for every gear production job: Fellows Gear Shapers, Pfauter Gear Hobbers, Fellows-Reishauer Gear Grinding Machines, Fellows Gear Shaving Machines and Fellows Inspection Instruments.

If you make gears of any size, from 1/16" P.D. to 120" P.D., Fellows' 60 years of experience can help you improve quality and cut costs. For complete information on Fellows Gear Production Equipment, call your nearest Fellows office.



SHAPING. The versatile No. 7125 Fellows Gear Shaper gives Stanley high production speeds (up to 450 strokes per minute). It also provides fast, simple changeover from one job to another.

SHAVING. The No. 4 Fellows Fine Pitch Shaving Machine puts finishing touches on each pinion and adds the finish which results in long life and quiet operation.

INSPECTING. The No. 4 Fellows Fine Pitch Red Liner makes and records a composite check of gear accuracy, insuring high quality standards.

Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
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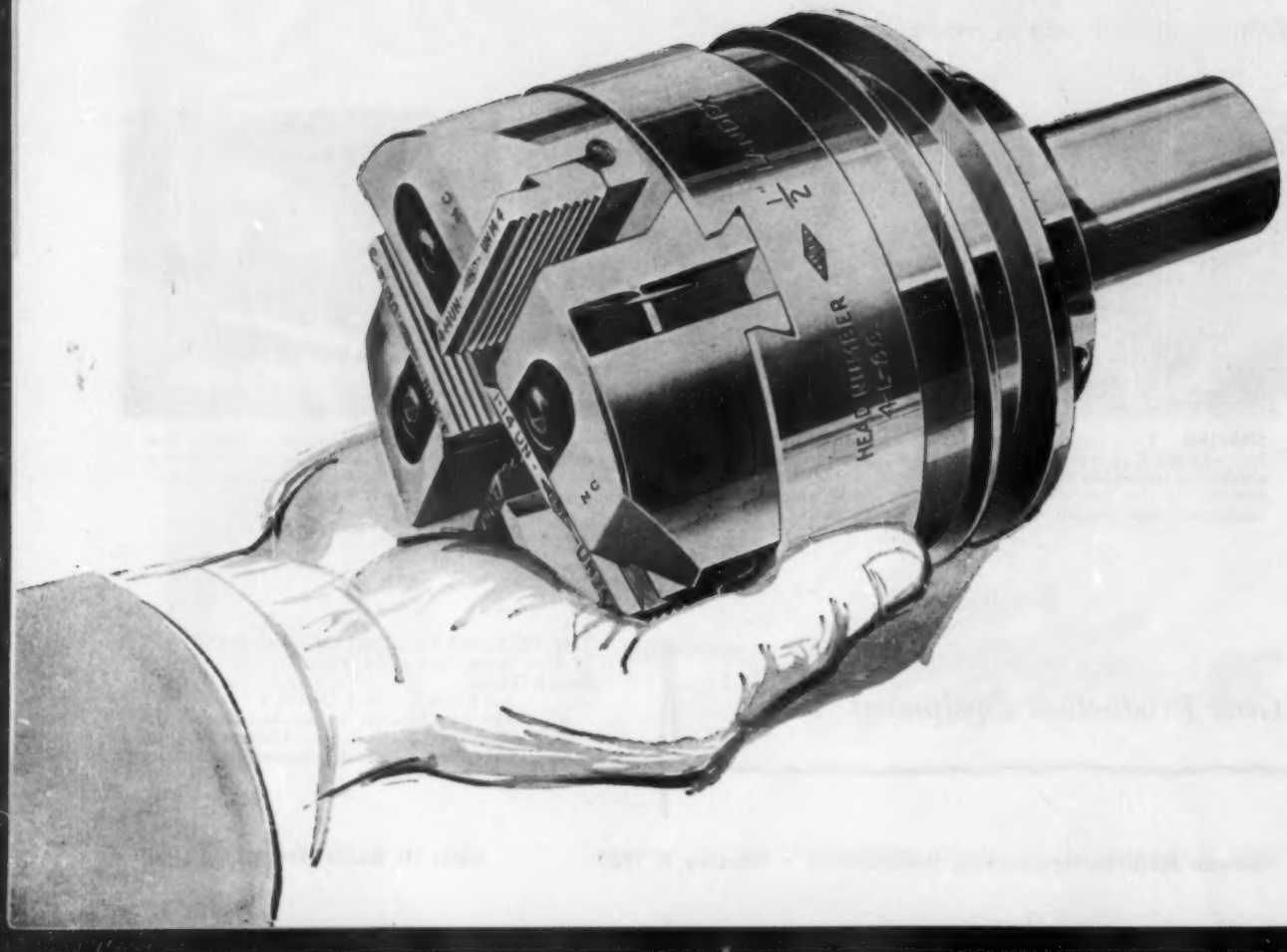
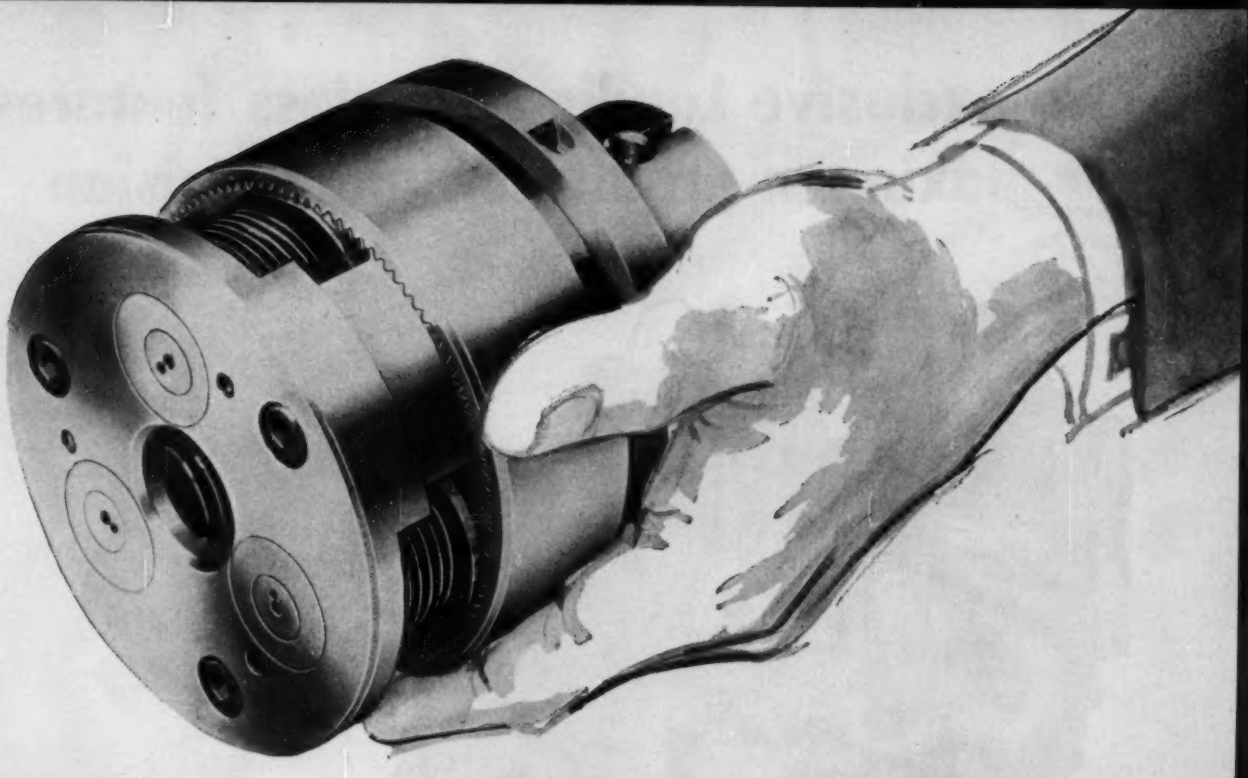
6214 West Manchester Avenue, Los Angeles 45

CUT or





ROLL threads?

You—as a metalworking manager—constantly face such decisions. Your answers are measured in terms of product cost, and require reliable information on relative output, tool cost, downtime, etc.

Providing you with such information is an important function of your LANDIS Representative. He is a trained Threading Engineer. He was scientifically selected, trained in our plant, and served an extensive field apprenticeship. His personal ability is backed by fully-staffed Engineering and Research facilities, and more than 50 years of knowledge and experience accumulated as Threading Specialists.

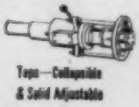
Whether you need data on which to base a buying decision—or help in developing special tooling for a particular threading operation—contact your LANDIS Representative. He can offer you a machine or tool from the most complete line in the world to thread by Cutting, Rolling, Tapping, or Grinding.

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U.S.A.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

Threading Machines



Taps—Collapsible & Solid Adjustable

Centerless Thread Grinding Machines

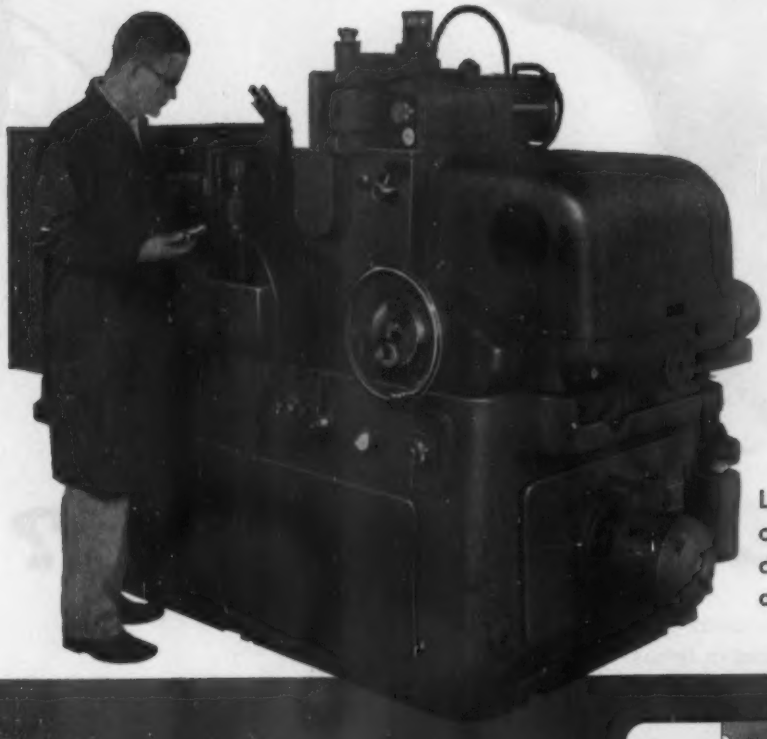
Thread Rolling Machines

Die Heads—Rotary & Stationary

Thread Rolling Tools

574C

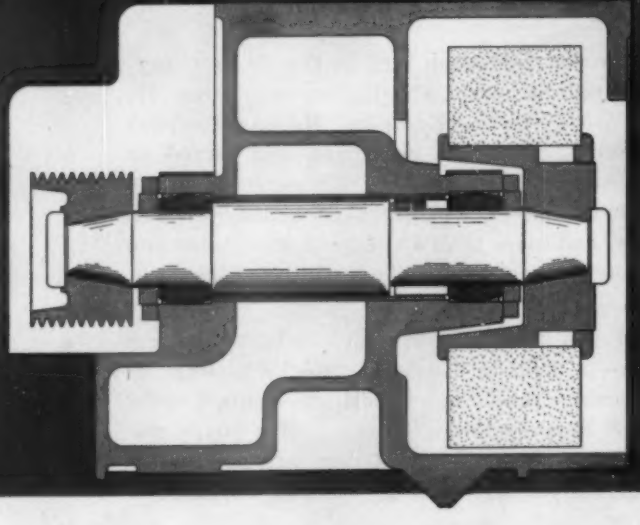
Two exclusive Landis Centerless features for maximum production and precision



Landis #12 Centerless with power operated loader and automatic cycle grinds 380 special piston assemblies per hour.

Rigidized Spindles

Increased diameter between bearings provides greater rigidity for fine finishes. Microsphere bearings telescoped into wheel centers for maximum stability under heaviest cuts.



MMT·PE

LANDIS

precision grinders

Microsphere Bearings

Close running clearance gives faster sparkout and accurate response to feed changes. Simple, one piece bearings with babbitt lining for long life and dependable operation.

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Effective immediately...
American Machinist/

HERE'S WHY: American Machinist, as a name for this 83-year-old publication, is today one of the most complete misnomers in industrial publishing.

It was a fine name back in the days when a machinist was a man who ran his own business. Today, all the average machinist runs is a machine—and American Machinist has not been edited for *him* for fifty years.

We are adding the phrase "Metalworking Manufacturing" to re-emphasize two fundamentals on which our editorial policy has always been based:

1. Metalworking, to which our magazine is dedicated, is an industry in itself; an industry in which basic techniques and processes create a community of interest, regardless of the product being turned out.

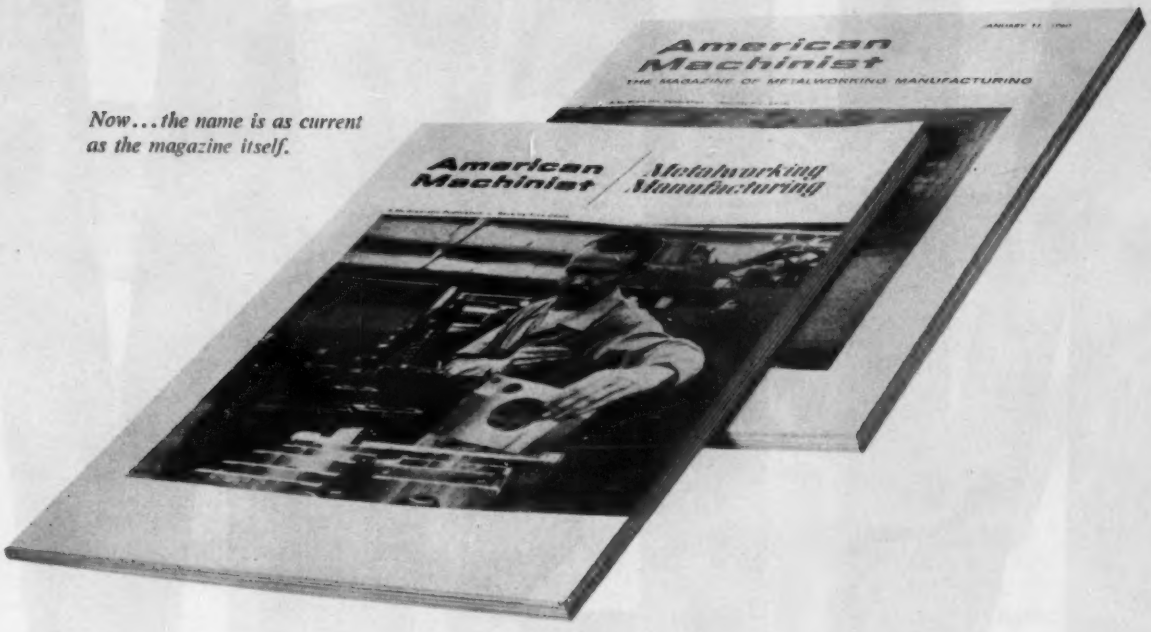
Metalworking begins where production of the basic metal leaves off. It covers all phases of planning, administration and execution involved in converting metal into finished products or components.

2. Manufacturing, the basic process of working metal into products, is, and always has been, the editorial province of American Machinist. The magazine draws its readers from manufacturing management men in metalworking, and men who aspire to manufacturing management positions.

These two common denominators of reader interest have made American Machinist the manufacturing publication in the metalworking field for men with the following areas of responsibility:

Top Manufacturing Management—top officials in charge of over-all manufacturing operations, controlling costs, financing facilities, and evaluating the efficiency of people, techniques and equipment.

Manufacturing Engineers—production planners whose recommendations and decisions determine how to make it; what equipment to make it on; how long it will take to make; what it will cost; how materials can be "worked" most efficiently, whether or not to sub-contract . . . and much more.



Now...the name is as current as the magazine itself.

American Machinist becomes *Metalworking Manufacturing*

Plant Management—the "doers"; the men who create reality out of the drawing-board concepts; the functional group that has the decisive voice in determining procedures, techniques and equipment used in the actual manufacture of the product.

Our ABC statement for the 6 months ending December 1959 will be in a new form recognizing this basic organization of manufacturing in the metalworking industry. The new form, based upon reader function rather than title, will make it possible to break down our circulation by the three manufacturing functions described above. Those who seek an even finer breakdown can determine our circulation in the metalworking field on a four-digit SIC basis.

◆ ◆ ◆

A change in a magazine's name—especially in the case of a publication that has been a leader in its field for 83 years—is not a step taken lightly. We believe it will be welcomed by subscribers and advertisers alike—pinpointing more sharply, as it does, not only the editorial appeal of the magazine for subscribers, but the important market reached through the magazine for our advertisers.

At the same time, we would like to emphasize that nothing about the magazine itself is being changed except its name.

As the postwar population explosion triggers the boom that will highlight the economy of the 60's, American Machinist/Metalworking Manufacturing will continue its leadership in reporting new developments in technology to manufacturing men in metalworking—developments that will result in manufacturing more, and faster, at a lower cost, to meet the rapidly growing demands of a vastly increased population . . . and enable America to continue to compete in world and domestic markets.

A McGraw-Hill Publication • 330 West 42nd Street, New York 36, N.Y.

NEW WARNER & SWASEY

Unique, Automatic Headstock

More Speeds – Greater Range –The new eight-speed headstock (16 with a two-speed motor) gives you more speeds in a wider range – from 45 to 2262 rpm – for maximum metal removal efficiency.

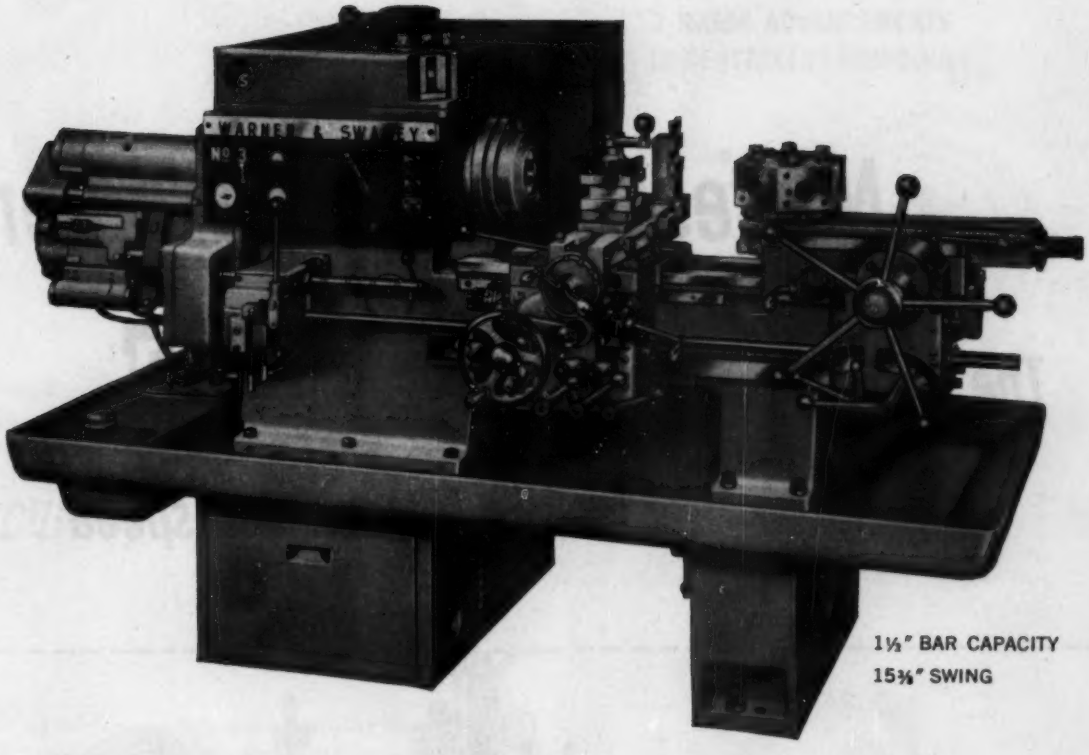
Instant Speed Changes throughout the full range are made possible through exclusive, Warner & Swasey designed direct-acting hydraulic clutches (which never need adjustment) in combination with a constant mesh, helical gear train. Time loss for gear shifting in conventional headstock gear trains is eliminated.

Full Power is always available at the spindle nose by the higher-powered, direct-mounted motor. Direct mounting also eliminates motor-drive maintenance problems.

New, Rugged Bar Feed and Collet Chuck are hydraulically operated with single-lever control for easy, fast handling. The wider base and rigid construction of the bar feed permits greater accuracy and smoother work finishes on high-speed, heavy-duty work.

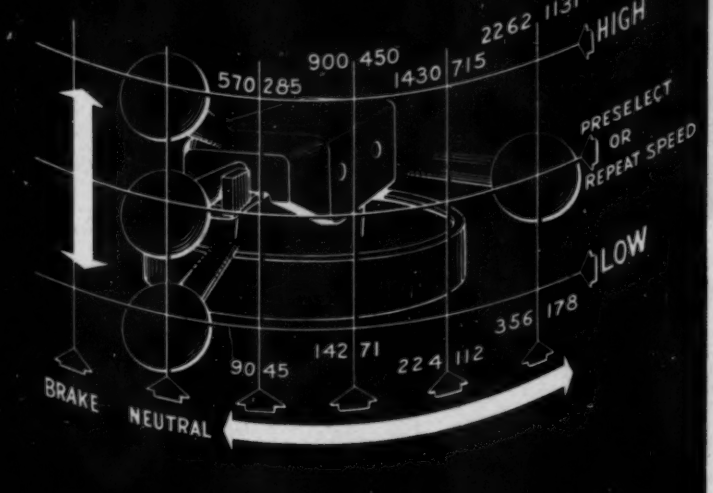
CIRCLE 165 READER SERVICE CARD

This is the new exclusive single lever headstock control . . .



1½" BAR CAPACITY
15⅜" SWING

No.3 ram type turret lathe



This is how easy it is to operate

Exclusive, Single Lever Preselector and Speed Control

Control of spindle speeds is now an easy one-hand operation on the new No. 3! Preselection of speeds, speed change, brake and neutral—all are obtained with the same lever!

No fumbling for speeds... no gear shifting. Just rotate the handle to preselect; move it up or down to engage new speed instantly.

No figuring... the direct reading preselector dial tells you the surface speed for each diameter and rpm.

No remembering (or forgetting)... the preselector drum lets you set up the sequence of cuts; numbered clips tell you where to find the speeds and their order of use.

Neutral (free spindle) and Brake are selected by rotating lever to the left.

Forward and Reverse are controlled by a switch lever on front of headstock.

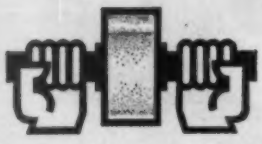
For free brochure write Warner & Swasey Company, Cleveland 3, Ohio.

You can produce it better, faster, for less... with a WARNER & SWASEY

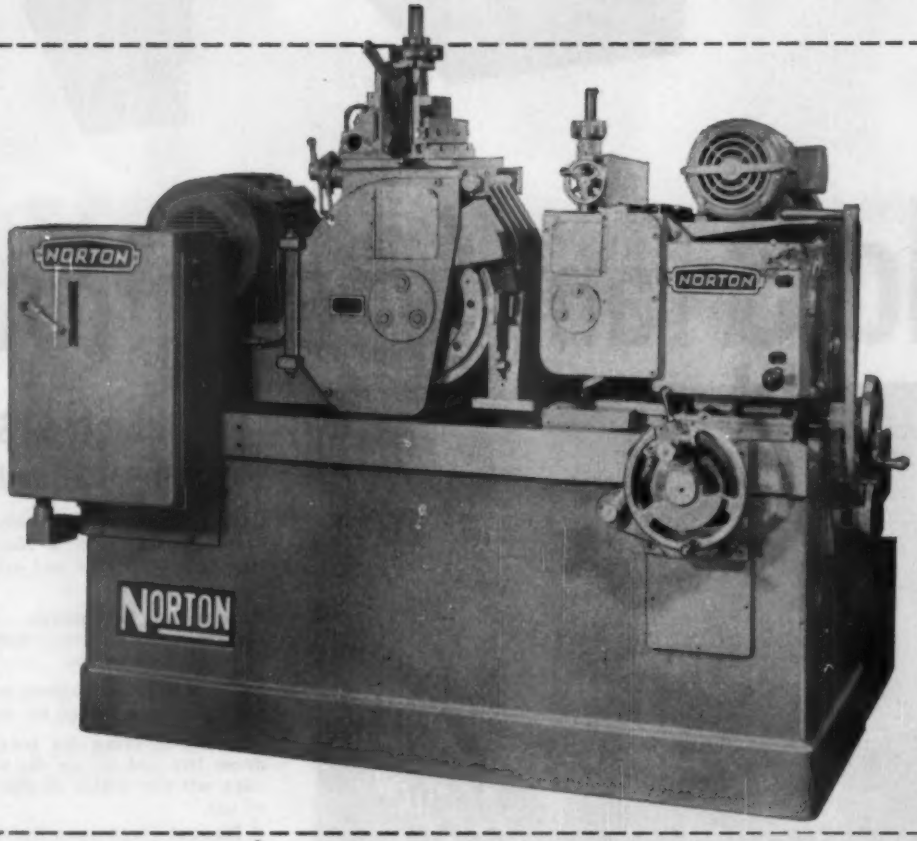
W S

Newest NORTON Grinder!

The No. 2 Straddle-Bearing

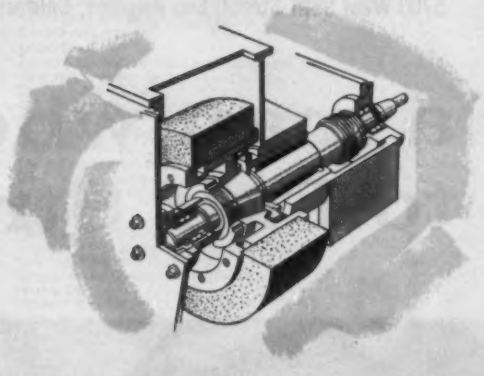


Centerless is built for speed . . .



Ready for Immediate Delivery
The new Norton No. 2 Centerless Grinder can be arranged for full automatic, semi-automatic or manual thru-feed or plunge grinding. Capacity includes work diameters ranging from 1/16" to 4 3/4" depending on type of work rest and bar grinding fixture.

3 MAJOR ADVANCEMENTS IN CENTERLESS GRINDING



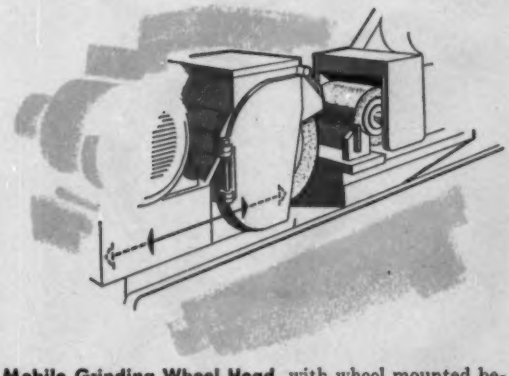
accuracy . . . economy

Straddle-Bearing Spindle Support, in both grinding and regulating wheels, provides extra strength. Combined with the inherent rigidity of Norton spindles this boosts capacity to take heaviest cutting pressures, while permitting fast grinding to close tolerances under all conditions.

Like all Norton grinders and lappers the Norton No. 2 *Straddle-Bearing* Centerless Grinder is built to deliver "Touch of Gold" performance — the Norton extra that adds value to your product while cutting your production costs.

You'll find plenty of proof of that in the modern construction of this newest machine of its type. *Straddle* support of spindle bearings adds strength and ability to take tough jobs . . . the mobile wheel head and constant work-loading alignment make jobs shorter and easier.

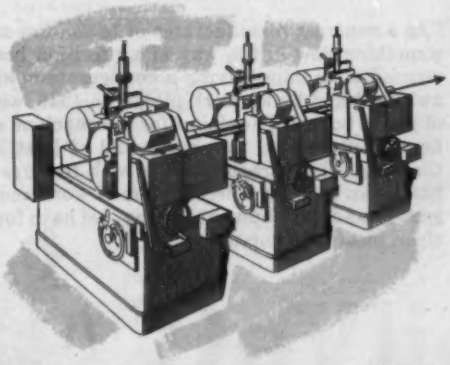
Many other features result in outstanding performance advantages. Call your Norton Sales Engineer, a trained expert in the grinding field, for consultation on how these features can benefit your production. Or write for Catalog 1328. NORTON COMPANY, Machine Division, Worcester 6, Mass.



Mobile Grinding Wheel Head, with wheel mounted between head ways and feed screw located beneath wheel center for ideal balance, provides instant response to signals. This results in especially fast sizing, one of many important advantages over fixed head operation.

NORTON
GRINDERS and LAPPERS

District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit.
In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.



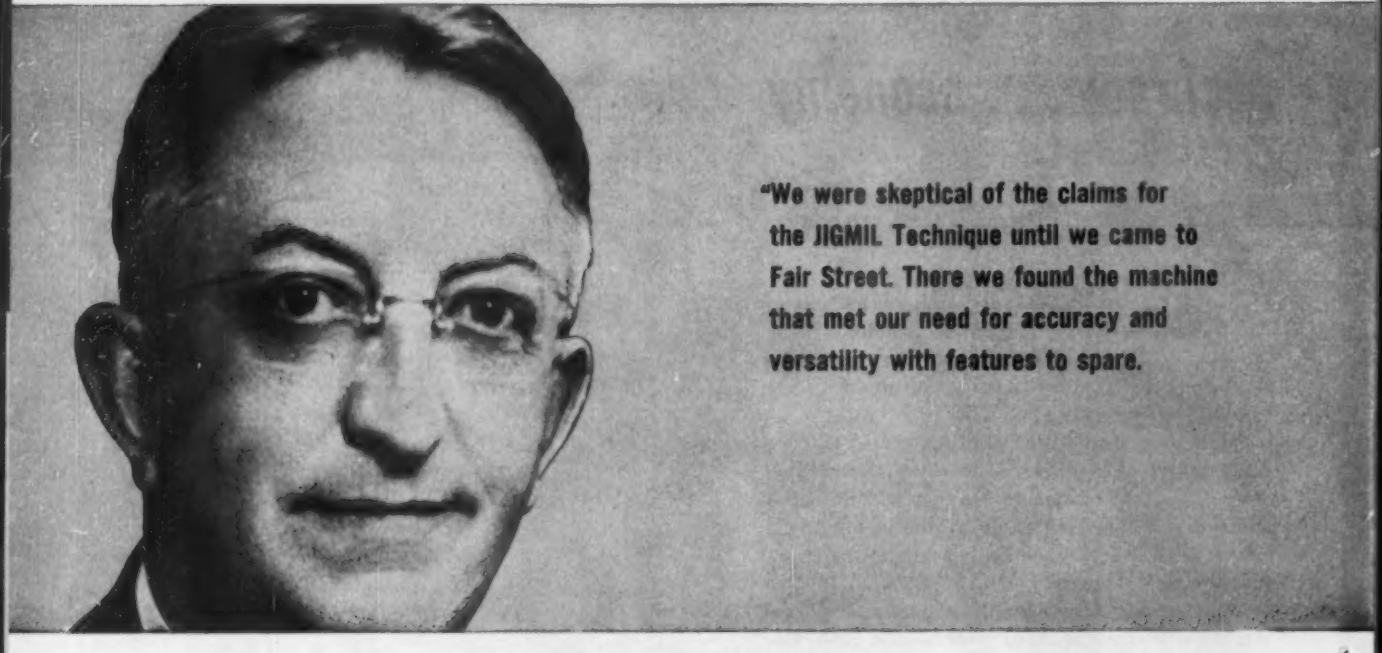
Work Loading Alignment is never disturbed by wear of either grinding or regulating wheel . . . neither is the alignment of the work rest blade. Movable heads for both grinding and regulating wheels make this advantage possible . . . and especially time-saving in a battery set-up.

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — BEAR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

C. T. WEITZEL, President, Mechanical Specialties Co.
5700 West 96th Street, Los Angeles, California

a man who came to Fair Street



"We were skeptical of the claims for the JIGMIL Technique until we came to Fair Street. There we found the machine that met our need for accuracy and versatility with features to spare.

"As a contract manufacturer of tools, dies and precision components, we long felt the need for something new in the way of a precision boring and milling machine. Among other things, we wanted a machine having a configuration which would permit easy set-ups of a wide range of awkward and bulky work pieces. In 1946, we heard about the JIGMIL and the JIGMIL Technique of jigless boring. The claims for this machine were so unusual that we discounted much of what we heard, but decided that we should at least look into it. At Fair Street, we found the machine that met all our requirements with features to spare. Our first JIGMIL put us in a position to handle an entirely different class of work and without doubt, aided materially in our subsequent growth and development. Today, we have four JIGMILS which are consistently busy and consider them ideal job shop machines."

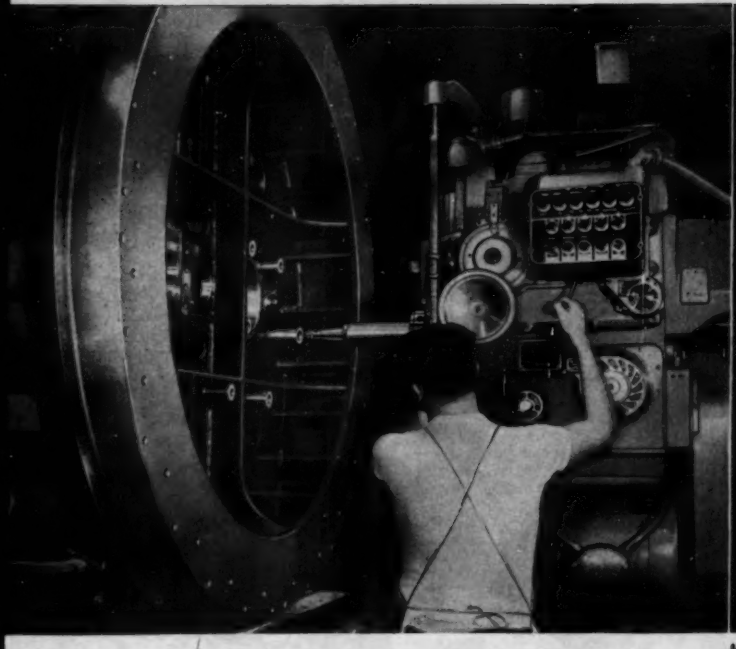
C. T. WEITZEL

DEVLIEG MACHINE COMPANY, FAIR STREET • ROYAL OAK, MICHIGAN

CIRCLE 169 READER SERVICE CARD

SOME OF OUR JIGMIL USERS

Aireseareh Mfg. Co., Div. The Garrett Corp.
Bell & Gossett Co.
The Brush Beryllium Co.
H. W. Butterworth & Sons Co.
Byron Jackson Pumps, Inc., a Subsidiary of Borg-Warner Corp.
Cameron Iron Works, Inc.
The Cleveland Pneumatic Tool Co.
Delco-Remy Div. General Motors Corp.
Eastern Air Lines, Inc.
Euclid Div. GMC
Fairchild Camera and Instrument Corporation
General Atomic Div. General Dynamics Corp.
Goodyear Aircraft Corp.
C. L. Gougler Machine Co.
Greenlee Bros. Co.
Hoover Tool & Die Co.
Hughes Aircraft Co.
The Hydraulic Press Mfg. Co.
I-T-E Circuit Breaker Co.
Kaiser Industries Corp.
Koppers Co., Inc.
Kurt Mfg. Co.
Librascope Incorporated
Lycoming—Div. of Avco Manufacturing Corporation
Manning, Maxwell & Moore, Inc.
Massachusetts Institute of Technology
Maytag Co.
Menasco Mfg. Co.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL PRECISION applied to the guided missile program

Mechanical Specialties Co. uses the JIGMIL Technique for machining pieces such as this 3500 lb. traversing-launching ring for guided missiles. Part is set-up on a Model 3B-96 JIGMIL. Critical machining involves boring 24 indexing holes on a 60" dia. with hole spacing of ± .0005; an interior hole pattern of 5 holes coordinated to a master within ± .00025; 30 additional holes in a 30" x 36" rectangular pattern to ± .001; accurate milling of locating pads and boring of 3 large critical bores to ± .001.

McKiernan-Terry Corporation
National Cash Register Co.
Norden-Ketay Corp.
Robbins & Meyers, Inc.
Rocketdyne Div., North American Aviation, Inc.
Rohr Aircraft Corp.
AC Spark Plug Division, General Motors Corp.
Sperry Farragut Co., Division of Sperry Rand Corp.
Stratos Div. Fairchild Engine & Airplane Corp.
Sundstrand Machine Tool Co. (Aviation Div.)
Sylvania Electric Products, Inc.
Utica-Bend Corp., a Subsidiary of Curtiss-Wright Corporation

WILL YOU BE THE NEXT TO VISIT FAIR STREET

Our newest catalog will help you decide. May we send it?

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

CIRCLE 170 READER SERVICE CARD

MORSE TOOLS HELP BUILD CHARACTER FOR EIMCO

...Morse tough tools cut smooth, fast holes...help speed production of mining machines with guts.

For rough, rugged power, you can't beat Eimco mining machines. They move rock and ore . . . carry them up steep grades quickly and easily.

It takes tough tools to make these rugged machines. It takes Morse Cutting Tools . . . the toughest on the market. They cut smoother, faster – and last longer.

Let Morse help you make your tough jobs easy. Call your Morse-Franchised Distributor today. He'll give you the story.

MORSE

means "THE MOST" *in Cutting Tools*

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASSACHUSETTS

Warehouses in: NEW YORK • CHICAGO • DETROIT • DALLAS • SAN FRANCISCO

Morse means more production... smoother, more accurate production . . . with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want *Morse Quality*, there's only one way to get it . . . *specify Morse.*

VN

A Division of VAN NORMAN INDUSTRIES, INC.

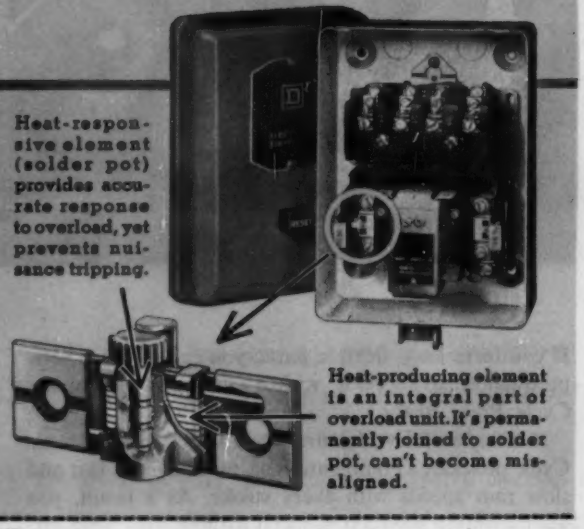
CIRCLE 171 READER SERVICE CARD

8297

ONLY SQUARE D STARTERS WITH ONE-PIECE OVERLOAD RELAYS GIVE ABSOLUTE PROTECTION!

• Only Square D makes thermal overload relays with 1-piece construction—and only with 1-piece construction can you *know* you've installed the heater correctly. Square D 1-piece overload relays can be installed only one way. They are factory-assembled, individually tested and calibrated, completely tamper-proof. Repeated tripping will not affect accuracy.

You *pay* for overload protection—be sure you *get* it. Insist on Square D 1-piece overload relays for *absolute* protection.


Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.
Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

EXCLUSIVE—1-piece Overload Relay for ABSOLUTE Protection!

Mail coupon today for simple "jig-saw" demonstrator—see why only Square D gives absolute protection

Square D Company
Department SA-236
4041 North Richards Street
Milwaukee 12, Wisconsin

Please send me information on Square D magnetic starters, along with your simple 3-minute "jig-saw" demonstrator

NAME_____

COMPANY_____

ADDRESS_____

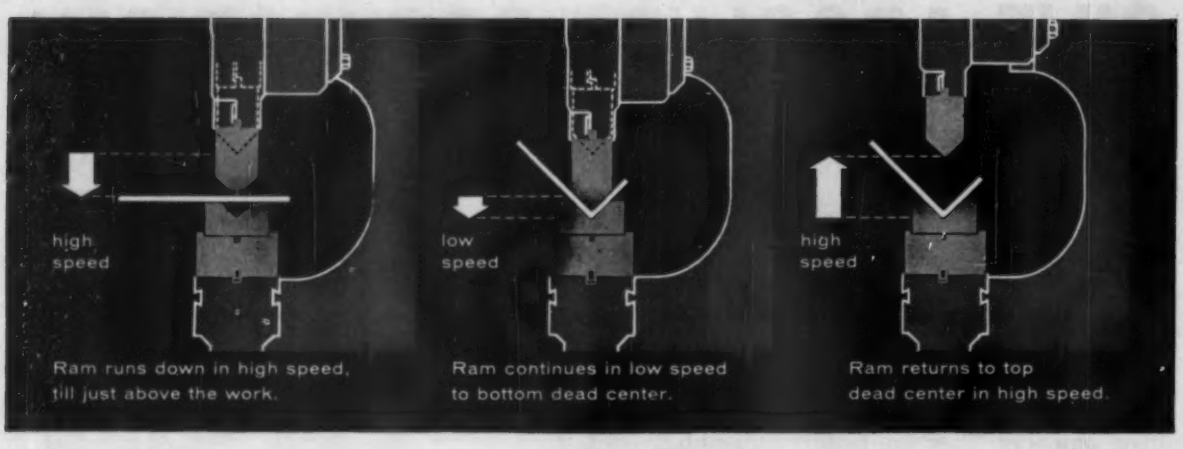
CITY_____ ZONE____ STATE_____

SQUARE D COMPANY

wherever electricity is distributed and controlled

INCREASE PRODUCTION AS MUCH AS 60% WITH CINCINNATI®

Automatic Cycle Press Brakes


high speed
low speed
high speed
Ram runs down in high speed, till just above the work.
Ram continues in low speed to bottom dead center.
Ram returns to top dead center in high speed.

If you form long, flexible parts, you can increase your production up to 60% with a Cincinnati Automatic Cycle Press Brake.

A new, exclusive feature, the Cincinnati Automatic Cycle provides a combination of instantaneous fast and slow ram speeds with every stroke. As a result, you get maximum production speed without the "whip up" and "back bending" which often occur in high speed forming of long parts which have no beam strength.

You no longer have to rely on the operator's skill at clutch slipping to obtain parts that are free of "back bends."

You can get this money-making feature on all new 7 and 9 Series Cincinnati Press Brakes.

This productive new feature means a lot of advantages for you:

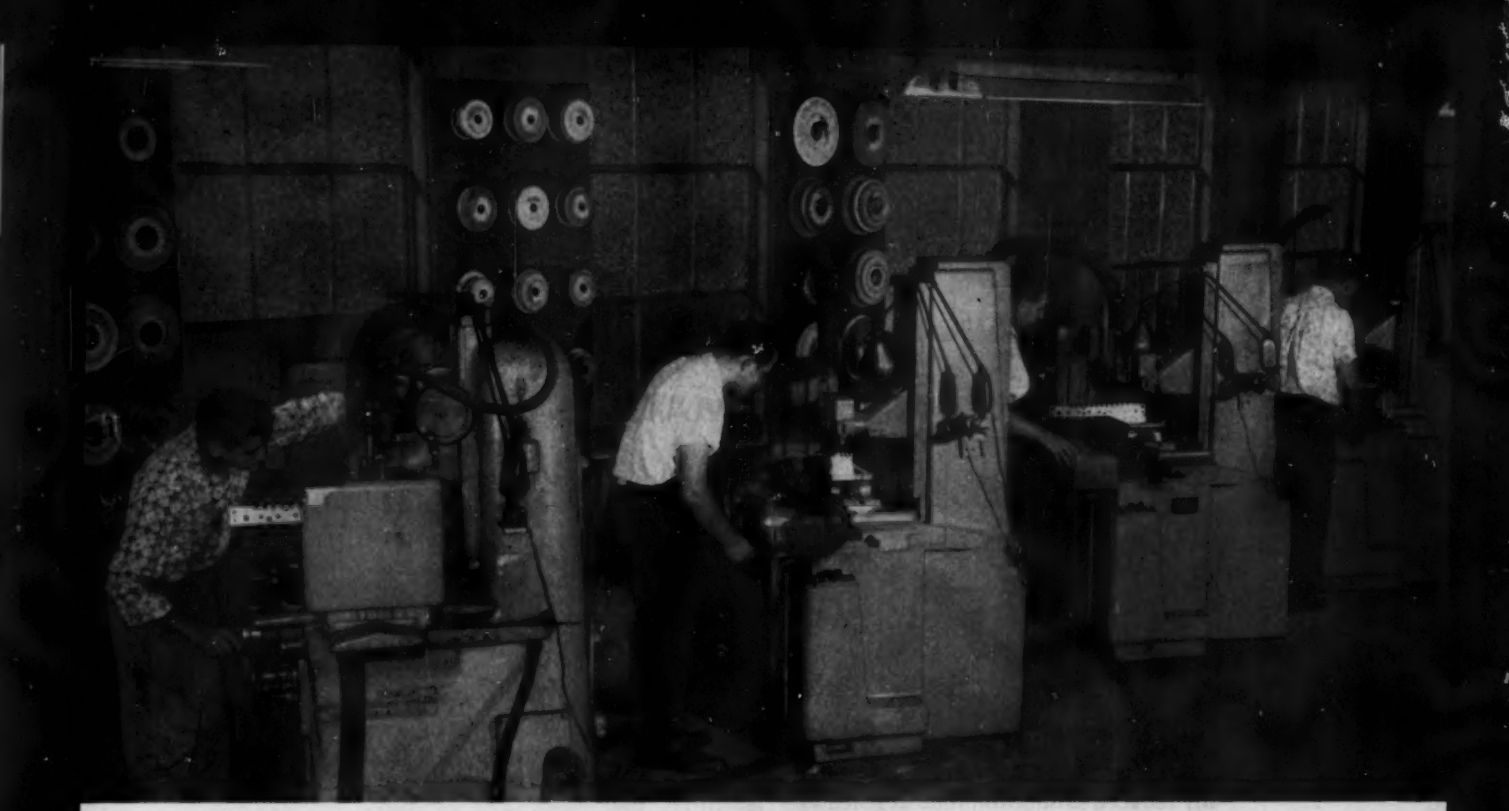
1. Job records show 10% to 60% increase in parts formed per hour.
2. Low speed portion of the ram stroke can be set so that all strokes are identical in length.
3. Rejects caused by "back bends" are stopped.
4. Highly experienced operators are not required.
5. Operator fatigue is greatly reduced because there is no need for clutch slipping.
6. Clutch and brake are long-life, minimum-maintenance units requiring no adjustments.

Write Dept. A for full details about the Cincinnati Automatic Cycle, Bulletin B-9R.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.



Four Landis Abrasive Surface Grinders in operation at the Progressive Tool Company, York, Pennsylvania

LANDIS Abrasive Surface Grinders demonstrate dependable precision in tool and die plant

Grinding the punch holder of a progressive die on a Landis Abrasive 618. Tolerances are as low as ± .0001".

At Progressive Tool Company, grinding is their largest operation. In this modern plant, four Landis Abrasive surface grinders are used for a wide variety of precision operations on tools, dies, gauges and special machine parts. Progressive reports complete satisfaction with the ease of operation and accuracy of these machines.

ABRASIVE

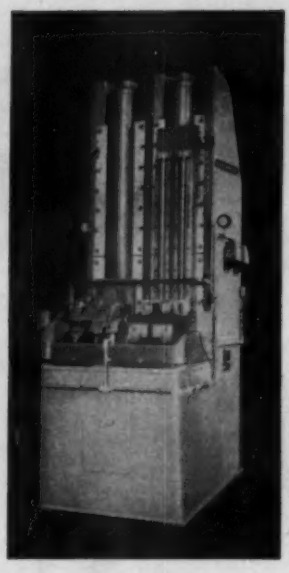
precision surface grinders

a product of

LANDIS TOOL

world's largest manufacturer of precision grinding machinery

WAYNESBORO, PENNSYLVANIA



LAPOINTE Double Ram Vertical Broaching Machine, 15-ton, 66-inch stroke used in broaching the Winchester Receiver.

When 17 LAPOINTE

BROACHING MACHINES

can do the work that would require at least 110 milling machines (and 80 operators),

that's truly spectacular cost reduction!

What would happen to your production costs if you could accomplish such results in your plant? It may be possible, for in one recent application Lapointe-Broaching actually reduced production time as much as 97%.

Although cost-reduction is an important advantage when removing metal by Lapointe-Broaching, there are also impressive product improvements to be gained. For example, in broaching the Winchester Receiver they obtained —

- Consistency of sizes
- Very small burr thrown up by the broaches, virtually eliminating inter-operational deburring which often costs as much as the machining operation
- Positioning of surfaces broached
  (No trouble in fixturing as the parts pass from one broaching operation to another)
- Excellent surface finish

Discussion of some of your production problems with a qualified Lapointe Field Engineer may lead to substantial savings through conversion to Lapointe-Broaching. It will cost you nothing to find out!

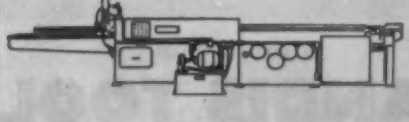
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

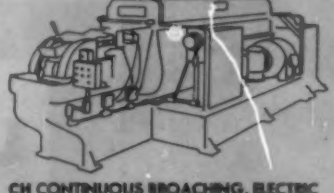
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

MMT=PE

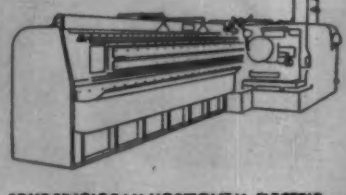
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



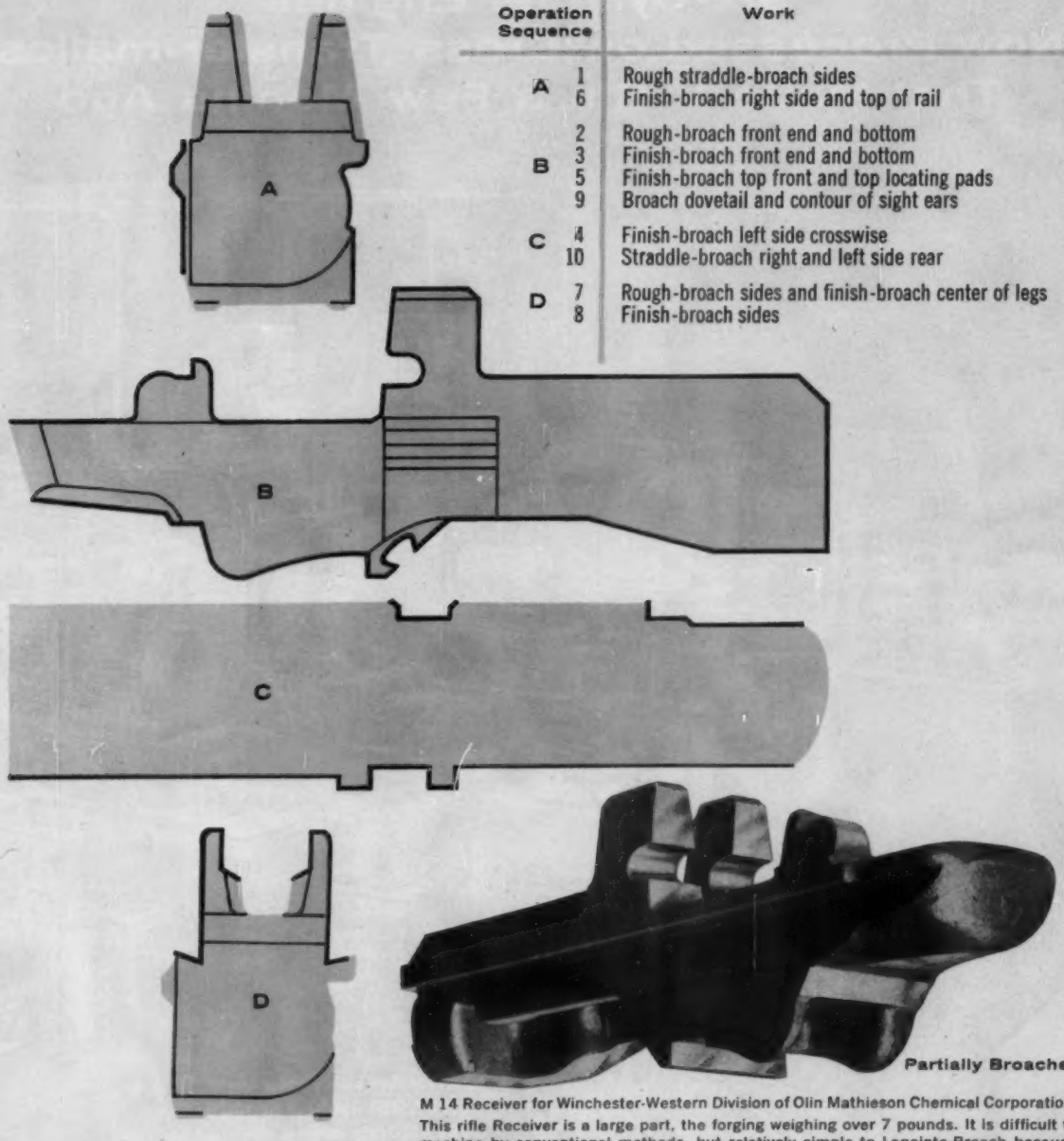
60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

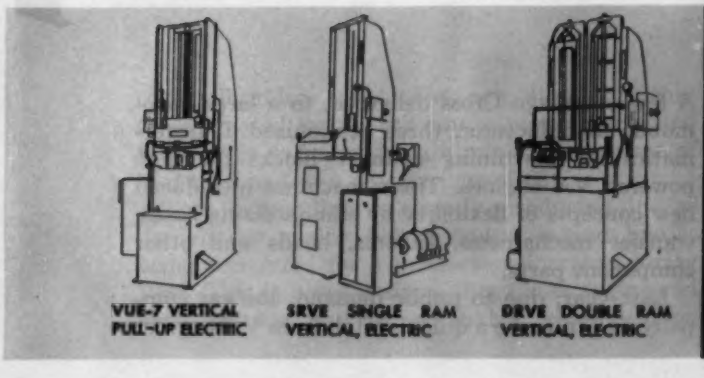


SRHE SINGLE RAM HORIZONTAL, ELECTRIC



Operation Sequence		Work
A	1	Rough straddle-broach sides
	6	Finish-broach right side and top of rail
B	2	Rough-broach front end and bottom
	3	Finish-broach front end and bottom
	5	Finish-broach top front and top locating pads
	9	Broach dovetail and contour of sight ears
C	4	Finish-broach left side crosswise
	10	Straddle-broach right and left side rear
D	7	Rough-broach sides and finish-broach center of legs
	8	Finish-broach sides

M 14 Receiver for Winchester-Western Division of Olin Mathieson Chemical Corporation. This rifle Receiver is a large part, the forging weighing over 7 pounds. It is difficult to machine by conventional methods, but relatively simple to Lapointe-Broach because the patented Lapointe Tip-Down table makes loading so easy . . . all the holding fixtures are built with hydraulically operated clamping mechanism to prevent operator fatigue.



LAPOINTE
known to be the best in
BROACHING

Six-Cylinder Engines Now Processed on Cross Transfer-matics That Made V-8's a Few Months Ago

PART: In-line six-cylinder block.
OUTPUT: 100 per hour at 100%
OPERATIONS: Milling, drilling, boring, reaming and tapping.

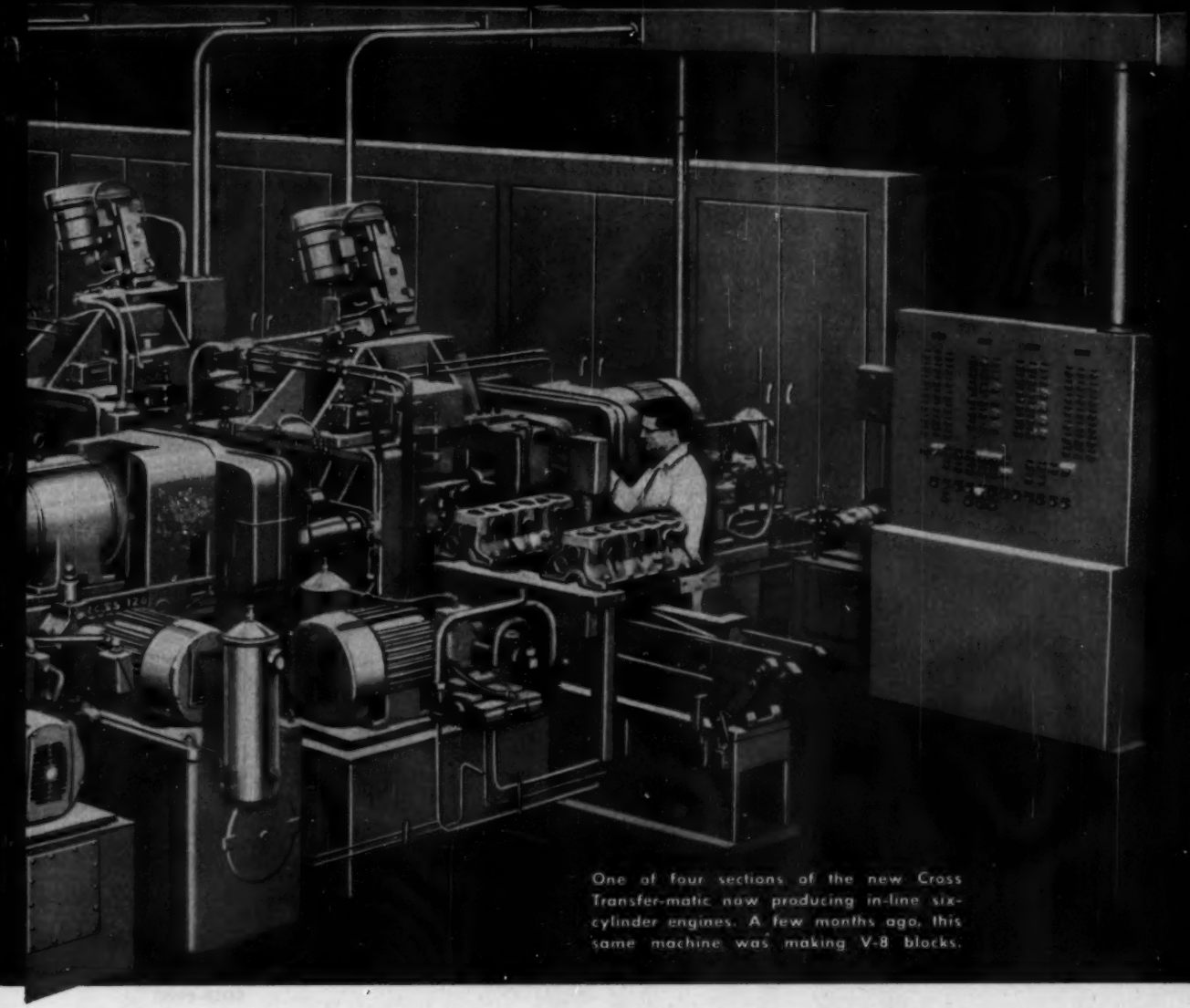
Cross "Building Block" Construction Permits Reworking Line at 40% of Original Cost

A few years ago Cross delivered, to a large automobile manufacturer, three Sectionized Transfer-matics for machining cylinder blocks for high powered V-8 engines. These machines introduced new concepts of flexibility by standardizing bases, transfer mechanisms, fixtures, heads and other component parts.

Last year, due to public demand, the car company had to make a quick switch from V-8 engines

CIRCLE 177 READER SERVICE CARD

Another Transfer-matic by Cross



One of four sections of the new Cross Transfer-matic now producing in-line six-cylinder engines. A few months ago, this same machine was making V-8 blocks.

to small in-line sixes. The new standards that Cross created for these Transfer-matics permitted the change to be made in a minimum amount of lead time and at a cost savings of 60%.

Today, one line is already producing in-line six-cylinder engine blocks and a second line is being converted for a production increase during 1960. This is proof positive that Cross engineered flexibility does pay off and that it costs no more.

Established 1898

THE **CROSS** CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

CIRCLE 178 READER SERVICE CARD

two more cases where PARTS PRODUCED FROM provide excellent bearing properties

CASE HISTORY

MUELLER BRASS CO. 600 ALLOY screw machine product used in heavy duty farm equipment

This heavy duty planetary pinion shaft, made as a screw part from tough "600" series bearing alloy, was the answer to a continuing wear problem encountered in the driving mechanism of heavy-duty farm equipment and big trucks. The part is machine produced to exacting tolerances and all necessary finishing operations are done by Mueller Brass Co. so the pinion shaft is ready for installation when received. Since "600" alloy parts have been installed, no operating failures have been reported and the shafts have proved far superior to the material formerly used.

MUELLER BRASS CO. ANALYSIS SERVICE

You get sound, unbiased advice on the one best method of making your parts because Mueller Brass Co. is the only fabricator in the country offering all these methods of production. An experienced Methods Analysis Department has at its command a complete knowledge of the advantages and limitations of each production process. This unique technical service is your assurance of getting the best product at the best price . . . made the one best way!

COLD-PREST IMPACT EXTRUSIONS

PLASTIC INJECTION MOLDING

MUELLER BRASS CO.

MUELLER BRASS CO. 600 ALLOY

and maximum wear resistance in tough applications

CASE HISTORY

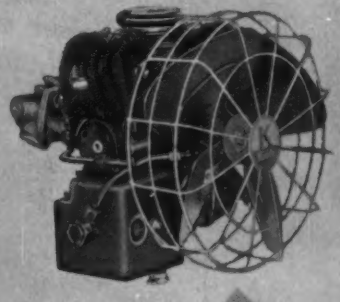
MUELLER BRASS CO. 600 ALLOY forgings used in aviation air compressors

Analyzing the job requirements of Walter Kidde & Company, Inc., for a main driving cam component to be installed in a reciprocating type of aircraft air compressor, Mueller Brass Co. Methods Analysis Engineers decided on a forging fabricated from "600" alloy as the most practical method of production. Since the cam forms the prime component of the driving mechanism, it must have good bearing wear surfaces and because the compressors are used in the aviation industry, the cams must be completely dependable. The close grained, strong forging that resists combination compressive and tensile stresses was the answer.

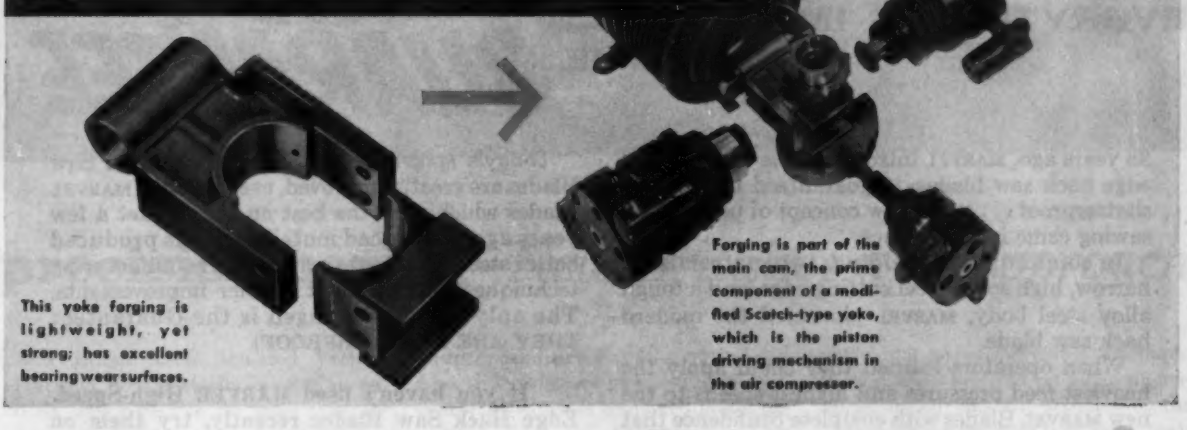
A typical compressor takes in ambient air and compresses it to 3000 psi or higher. This high pressure air is stored in metal or fiberglas containers until needed for actuation of pneumatic system components such as solenoid control valves, brake valves, manual control valves or actuators. These and other pneumatic units retract the entrance door, operate landing gear, wheel brakes, nose wheel steering systems, propeller brakes or perform other functions.

Aircraft in which Kidde compressors are installed include the Boeing 707, the Douglas DC-8, the Lockheed Electra, the Fairchild F-27 and various military aircraft.

Mueller Brass Co. produces press, hammer or cored forgings of any practical shape from a few ounces to 150 lbs. in brass, bronze, aluminum and magnesium in 27 standard, as well as special, alloys.



Aircraft air compressor equipped with hydraulic drive delivers air compressed to 3000 psi at the rate of 6 cfm.

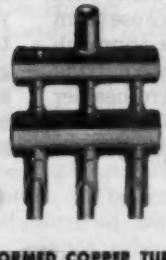


This yoke forging is lightweight, yet strong; has excellent bearing wear surfaces.

Forging is part of the main cam, the prime component of a modified Scotch-type yoke, which is the piston driving mechanism in the air compressor.

POWDERED METAL PARTS

SAND CASTINGS



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286

This is a MARVEL High-Speed-Edge Hack Saw Blade Cutting a 4" x 4" Titanium Billet

EVERYTHING'S IMPROVED BUT THE GUARANTEE

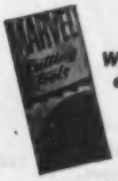
33 years ago, MARVEL introduced the first welded-edge hack saw blades . . . guaranteed them to be shatterproof . . . and a new concept of power hack sawing came into existence.

In combining, by welding, two materials—a narrow, high speed steel cutting edge, and a tough alloy steel body, MARVEL pioneered the modern hack saw blade.

When operators learned they could apply the heaviest feed pressures and highest speeds to the new MARVEL Blades with complete confidence that they would never shatter or "explode" to cause them personal injury, hack sawing began the approach to its present high level of efficiency. Even cutting "exotic" metals, such as titanium, where heavier feed pressures are a necessity, the MARVEL Blade does an outstanding job and is completely safe.

Today's MARVEL High-Speed-Edge Hack Saw Blades are greatly improved, even over the MARVEL Blades which were the best on the market a few years ago. Advanced metallurgy has produced better steels; new heat treating and manufacturing techniques have brought further improvements. The only thing unchanged is the Guarantee: THEY ARE SHATTERPROOF!

If you haven't used MARVEL High-Speed-Edge Hack Saw Blades recently, try them on your saws for a month and see the difference a truly superior blade can mean in higher speeds, greater accuracy, lower cost per cut, and guaranteed safety to operating personnel. Your nearby MARVEL Distributor carries a complete stock of MARVEL High-Speed-Edge Blades.



Write for Bulletin CT-175 which has complete details on MARVEL High-Speed-Edge Hack Saw Blades.

MMT-PE

MARVEL Metal Cutting SAWS

Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

CIRCLE 181 READER SERVICE CARD

CIRCLE 182 READER SERVICE CARD ►

precision boring–*New Britain's new approach*

New Britain Cam Actuated Vertical Precision Boring Machines offer an entirely new principle for more accurate boring and turning, plus compact exterior design and fast tooling. Rough cuts and finish cuts within close tolerances on the same set-up are characteristic. Standard models are available with maximum swing from 12″ to 17¾″ in 10 or 15 horsepower.

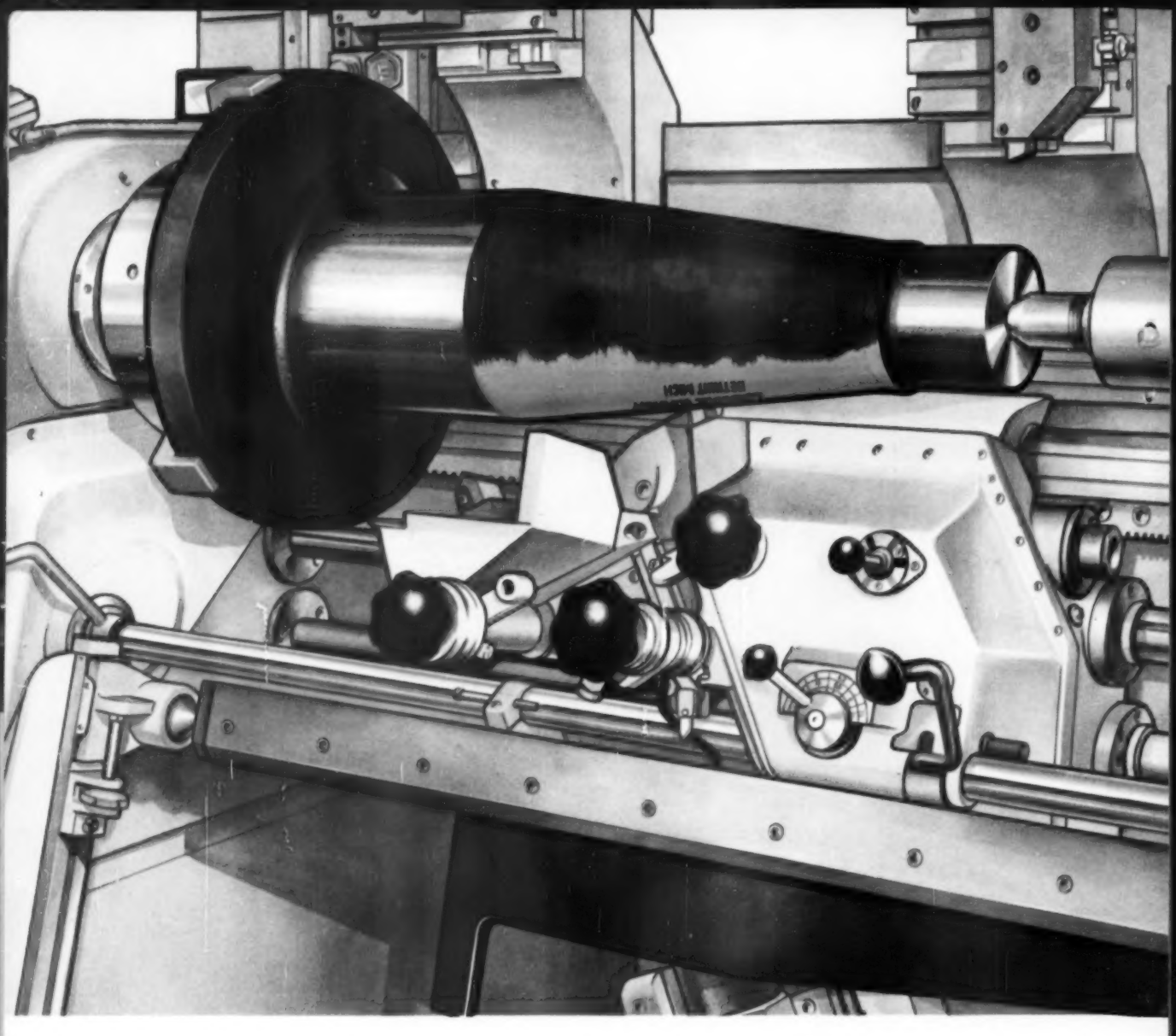
Here are a few of the major new developments incorporated in these unusual machines.

Greater accuracy. Both the vertical and cross slide cams are mounted on a common shaft which is contained inside the vertical slide. The linkages found in conventional cam-operated contouring machines are eliminated. Both the vertical and cross slides ride on preloaded roller bearings and are deflection-free.

Clean-sided design. Any number of these self-contained machines, each with one or more spindles, can be arranged side by side. Depending on how they are tooled, they operate either as a single unit or as individual machines. Parts can be inverted on adjacent machines or on adjacent spindles of the same machine, finishing both sides, completing *all* operations in one integrated, high-volume operation.

Fast tooling. Unrestricted accessibility allows rapid tool and cam changes.

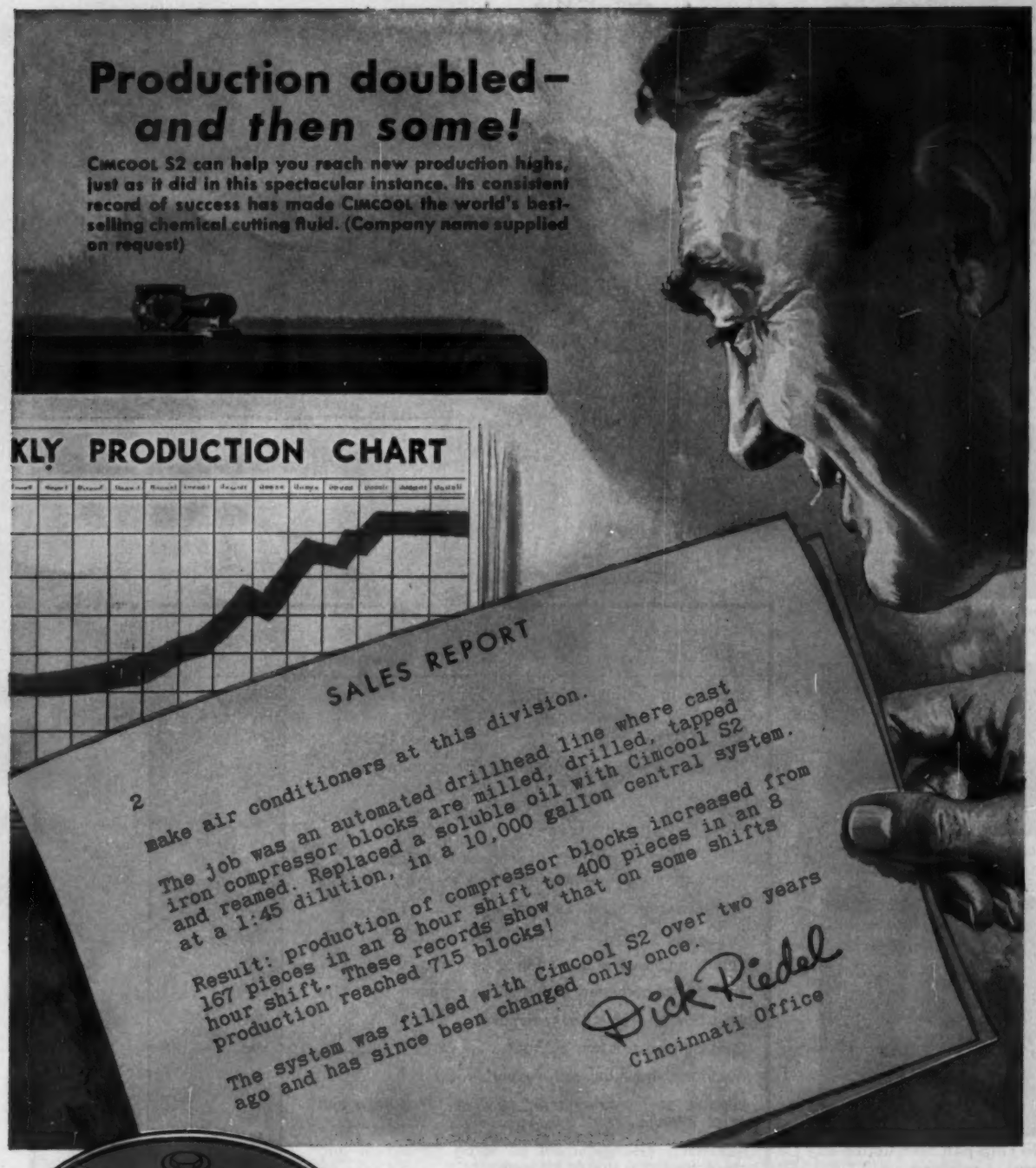
Complete catalog material is available. For your copy, write New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

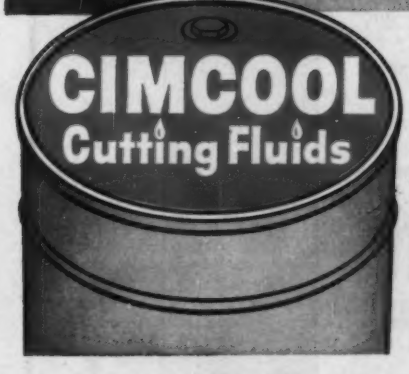


why a **copying lathe**–*why New Britain* +GF+

Beyond a certain point sustained production of the same piece on an engine lathe becomes uneconomical. Sometimes, however, the feeling exists that a copying lathe lacks flexibility, power and ruggedness or that it is just too "special." A New Britain +GF+ has power—25 to 40 h.p. The +GF+ has rugged design to handle big work and it's really flexible—a prototype or flat template will reproduce one or more pieces with fast, single point tooling. Whether it's shaft work or chucking work you have to do, ease of set-up is the same. The template or prototype can be changed in minutes. No special tooling set-ups are required, either. You can quickly switch from intricate cuts on slender shafts to heavy cuts on big castings or forgings (like the one shown). Complex profiling presents no problems even on jobs requiring really heavy metal removal.

Fast set-up and changeover from one type of work to another is only part of the story. There's much more that you'll want to know about the New Britain +GF+. Watching one of these machines in action is the best way to get the whole story and we'd like to arrange a demonstration for you. If you'd like to look over catalog material, we have that too, of course. Write New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.


Production doubled–
and then some!
CIMCOOL S2 can help you reach new production highs, just as it did in this spectacular instance. Its consistent record of success has made CIMCOOL the world's best-selling chemical cutting fluid. (Company name supplied on request)
KLY PRODUCTION CHART
SALES REPORT
2
make air conditioners at this division.
The job was an automated drillhead line where cast iron compressor blocks are milled, drilled, tapped and reamed. Replaced a soluble oil with Cimcool S2 at a 1:45 dilution, in a 10,000 gallon central system.
Result: production of compressor blocks increased from 167 pieces in an 8 hour shift to 400 pieces in an 8 hour shift. These records show that on some shifts production reached 715 blocks!
The system was filled with Cimcool S2 over two years ago and has since been changed only once.
Dick Riedel
Cincinnati Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

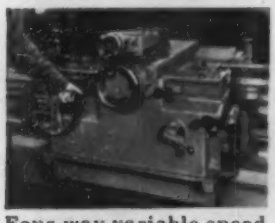
CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL — Newest in the famous, industry-proven line of CIMCOOL® Cutting Fluids.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO — CIMCOOL Tapping Compound — CIMCOOL Bactericide — CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

Chip flow to the rear of the machine for easy removal.

36 spindle speeds in a range of 8 to 1000 R. P. M.



Four-way variable speed power rapid traverse.

Power tailstock positioning on flame hardened bed ways.

No chip pan obstruction at front of machine.

Tailstock design permits setting compound rest parallel to work axis.

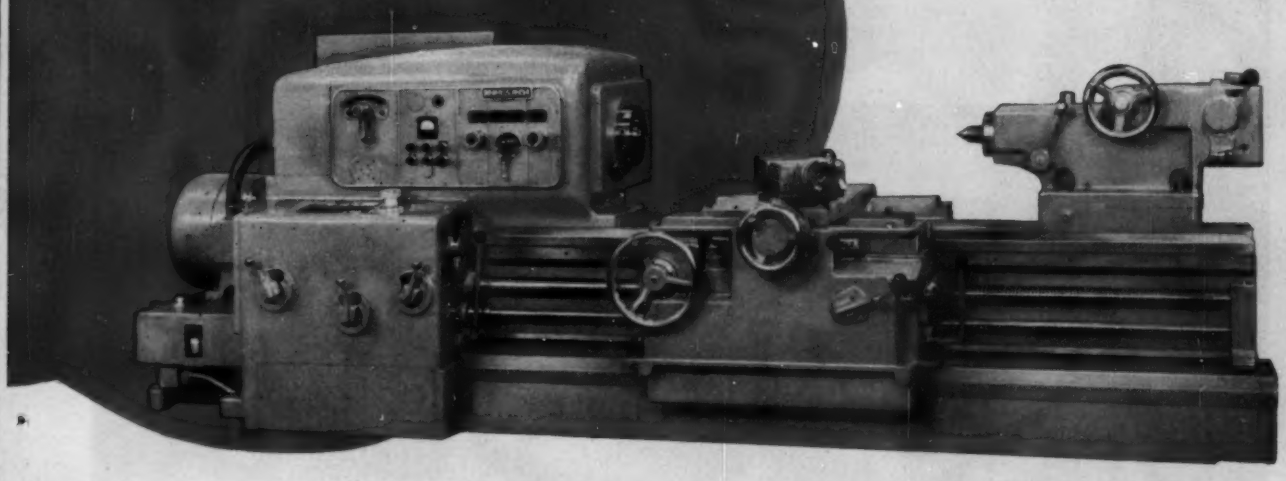
Check the Model 3220, feature for feature, against any other heavy duty lathe of similar swing capacity. Here are the major plus values. Add them up and you get only one answer — greater productivity hour after hour — day after day — year after year. This is worth investigation!

	Monarch Model 3220	Other 25" Or Model 3220 Machines
Number of spindle speeds	36	
Speed range	8 to 1000 R. P. M.	?
Surface cutting speed automatically calculated	Yes	
Hole in headstock spindle	3 1/16"	
Spindle jog	Automatic	?
Headstock lubrication	Mist	
Attention-free hydraulic clutch and brake	Yes	
Swing over bed and carriage wings	32"	
Bed width	26½"	?
Totally enclosed end gearing	Yes	
Four flame hardened and precision ground bed ways	Yes	
Chip flow to rear for easy removal	Yes	
Chip pan obstruction at front	No	?
Automatic traveling rod supports	Yes	
Variable speed power rapid traverse to carriage and cross slide	Yes	
Automatic disengagement of apron handwheel and cross feed dial during traverse	Yes	?
Apron handwheel and cross feed dial pick-up at same spot after traverse	Yes	
Feed range	.003" to .1683" per rev.	?
Backlash eliminator when using taper attachment	Yes	
Tailstock spindle diameter	6½"	
Power tailstock positioning	Yes	?
Anti-friction tailstock spindle suitable for drilling, tapping and reaming	Yes	
Tailstock design permits setting compound rest parallel to bed ways	Yes	
Stock removal, cu. in. per minute, up to	92	?
Net weight of base length (48") machine	19,660 lbs.	

YOU GET MORE...
YOU PRODUCE MORE

with the Monarch Series 80
Heavy Duty Dyna-Shift Lathe—Model 3220

(ALL DESIGNS DESIGNATED AS 25" LATHES)



You'll suffer — competitively — if you tool up today with yesterday's lathes for the boom of the Soaring Sixties. The Monarch Series 80 is truly the lathe of tomorrow, as are the other new Monarch high production and special purpose lathes. Send for our illustrated Booklet #1603 for full Series 80 information — or state your other interests.

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TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

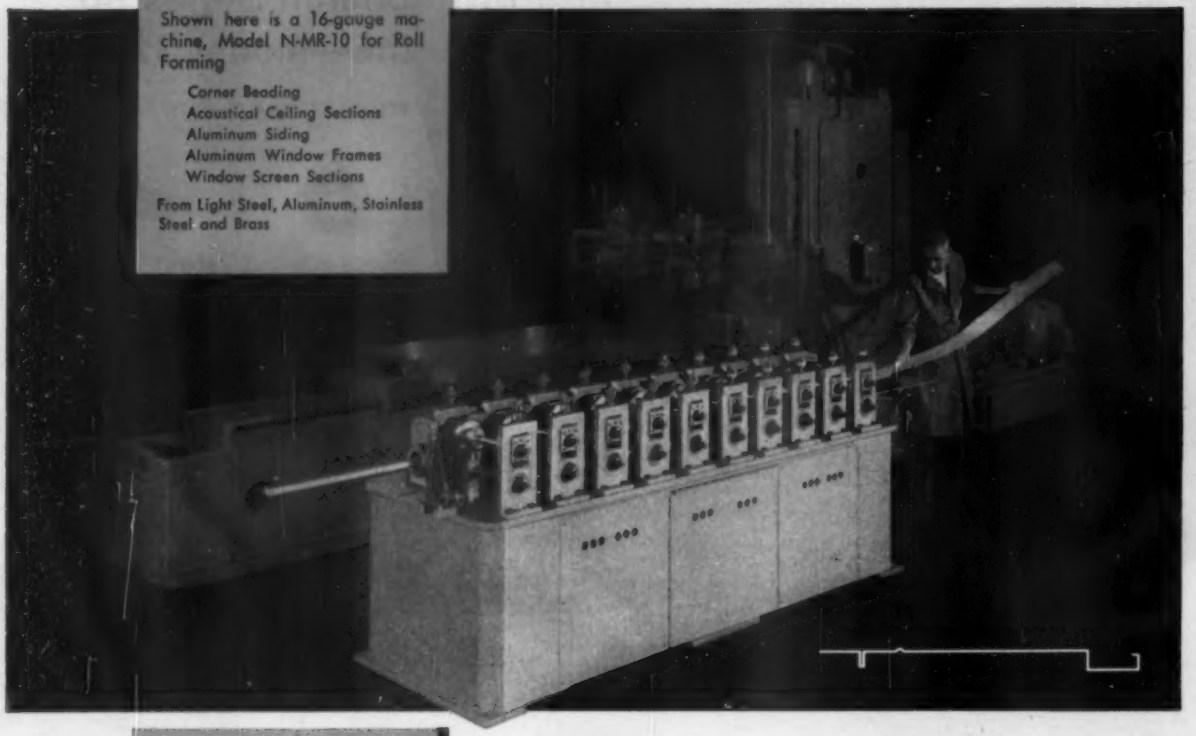
IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

For A Better Method of Forming Metal Up To 12 Gauge*...

DO IT FASTER, WITH LESS HANDLING, MORE OPERATIONS IN A SINGLE PASS!

with

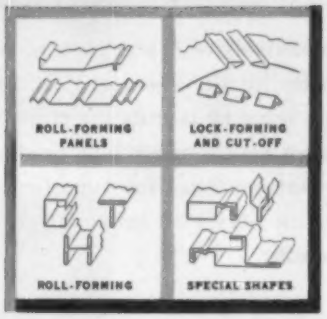
MAPLEWOOD ROLL FORMING MACHINES



Shown here is a 16-gauge machine, Model N-MR-10 for Roll Forming

- Corner Beading
- Acoustical Ceiling Sections
- Aluminum Siding
- Aluminum Window Frames
- Window Screen Sections

From Light Steel, Aluminum, Stainless Steel and Brass



MAPLEWOOD RMT ROLL FORMING MACHINES

DIVISION OF ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET ROCKFORD, ILL.

MAPLEWOOD GIVES YOU THESE BONUS FEATURES:

Variable Speed Drive with forming speed up to 200 fpm.

Adjustable Roll Center Distance from 4" to 5".

Sheet Metal Capacity Up To 72" wide.

See Maplewood Engineers for High-Speed Low-Cost Roll Forming Methods on Your Metal Sections.

**Heavier Gauges Quoted On Request*

COMPLETE LINE OF ROLL FORMING, CUT-OFF MACHINERY

CIRCLE 187 READER SERVICE CARD

CIRCLE 188 READER SERVICE CARD ►

ega

air-hardening tool and die steel (A.I.S.I. Type A-6), produced by Carpenter's exclusive MEL-TROL® process, offers unmatched uniformity and cleanness from surface to core, end to end, lot to lot. VEGA-FM combines the toughness, machining properties and simple low temperature heat treatment of an oil-hardening steel with the safety in hardening of an air-hardening grade. Prove for yourself its superiority.

Call your local Carpenter SERVICE-CENTER now for immediate delivery.

the *Carpenter* Steel Company, Reading, Pa.

"We break every rule in the book

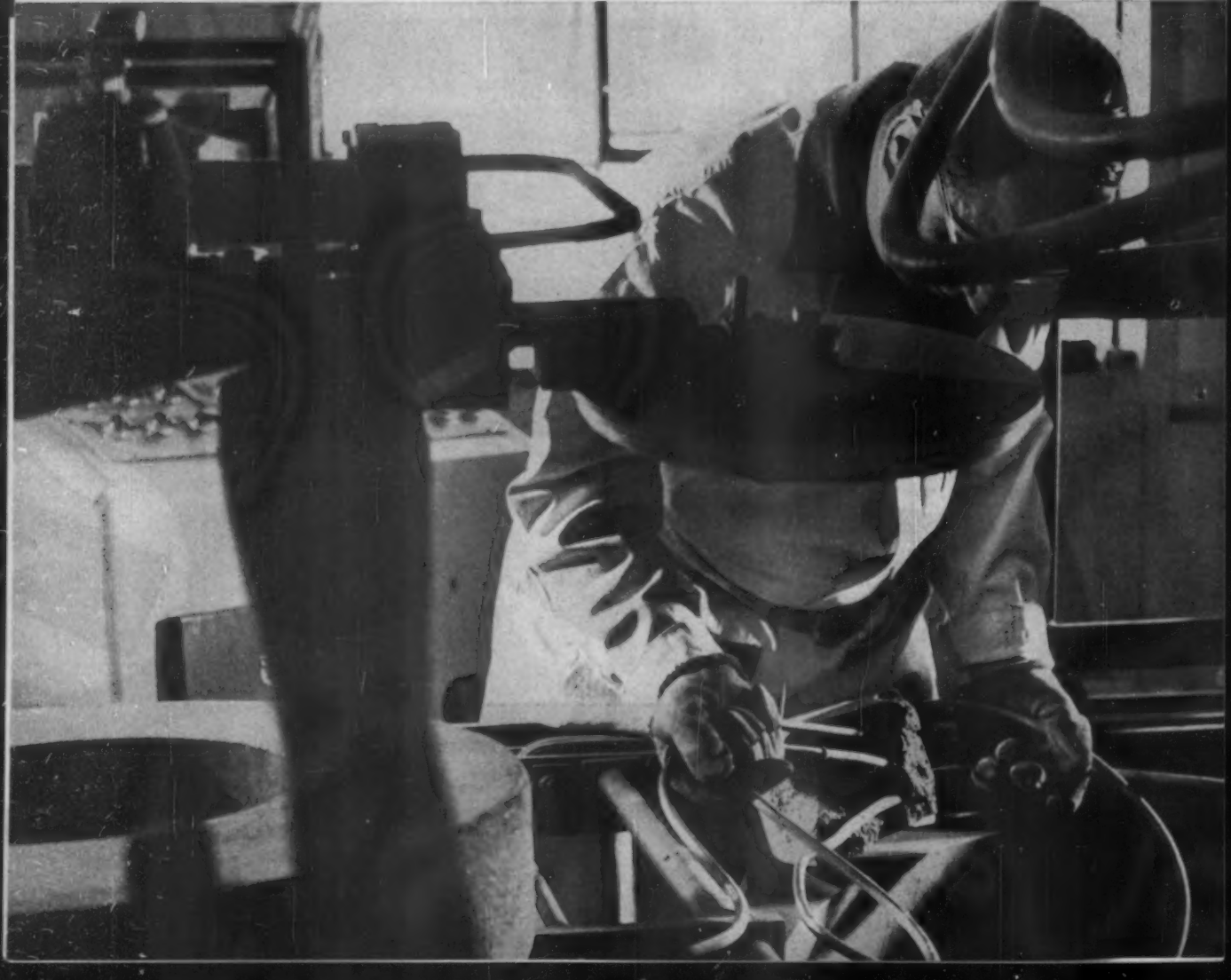
"We have one of the toughest testing programs in the entire industry. It breaks every safety rule that's ever been invented so that we can find out just how much punishment a grinding wheel can take.

"The test shown here, for example, is for heavy-duty snagging wheels that are used in foundries and steel mills. The wheel under test is locked into a steel drum that's built like a gun turret. Then the wheel is spun at speeds far beyond anything you can get with even the latest production equipment . . . until it finally explodes. Such tests as these have helped us formulate snagging wheels for manufacture with a *safety factor higher than ever before.*

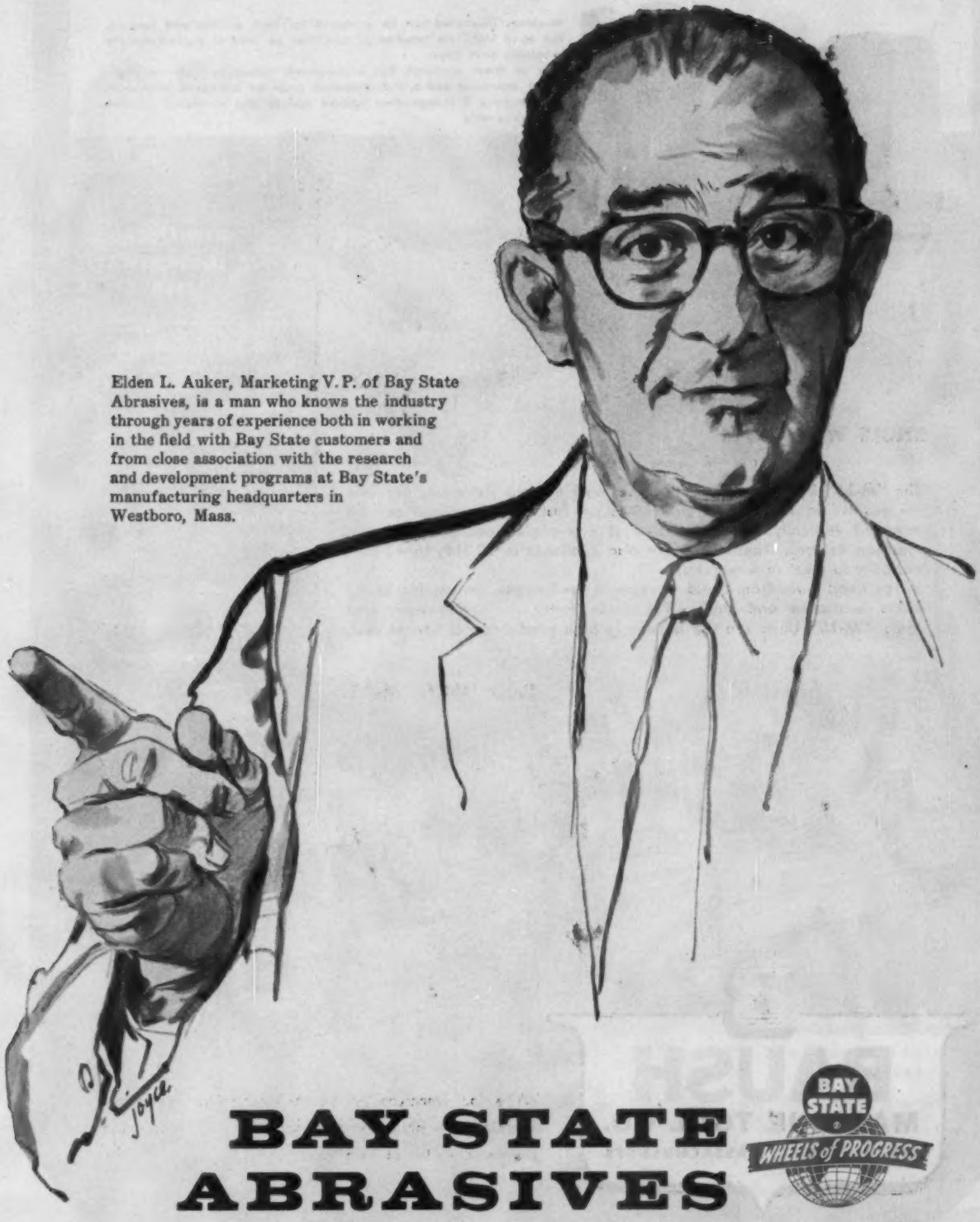
"This, of course, is only one of the more spectacular tests we make on all Bay State wheels. There are many others that probe the ultimate strength factors of every type of wheel under extremes of heat, vibration, tension, torsion and many other variables. And the purpose of these tests goes beyond ordinary standards, too. We are not just trying to produce *acceptable* wheels. We are out to make the best wheels that can be made . . . no matter *what kind* of wheels they may be!

"The record shows that BAY STATE quality also leads to lower grinding costs. You'll find your Bay State distributor or direct representative completely equipped and thoroughly trained to analyze your grinding operations for optimum performance and minimum cost."

"Better grinding at lower cost . . . that is our business."



for YOUR SAFETY..."



Elden L. Auker, Marketing V. P. of Bay State Abrasives, is a man who knows the industry through years of experience both in working in the field with Bay State customers and from close association with the research and development programs at Bay State's manufacturing headquarters in Westboro, Mass.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

939

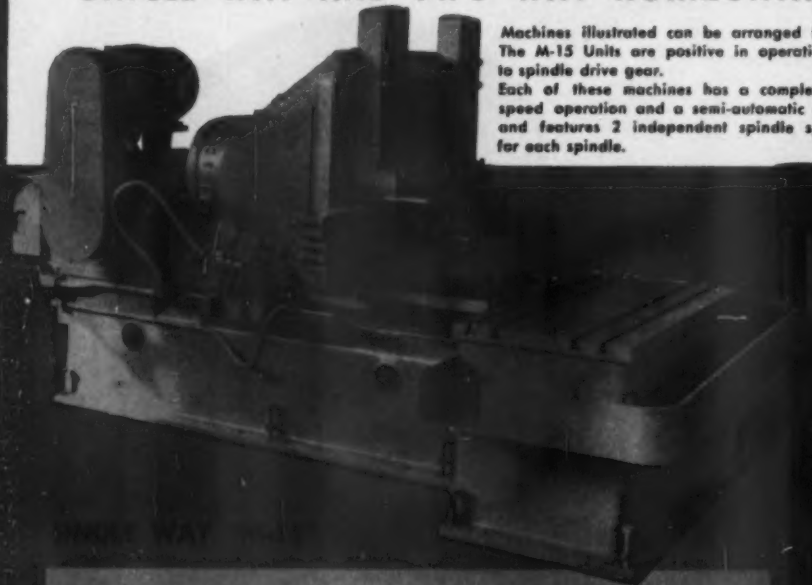
CIRCLE 190 READER SERVICE CARD

BAUSH MECHANICAL LEADSCREW FEED "M-15"

SINGLE-WAY AND TWO-WAY HORIZONTAL MACHINES

Machines illustrated can be arranged for both drilling and tapping. The M-15 Units are positive in operation as feed is geared directly to spindle drive gear.

Each of these machines has a completely automatic cycle for high-speed operation and a semi-automatic cycle for low-speed production and features 2 independent spindle speeds plus a neutral position for each spindle.



The "M-15" Units used on both these machines are extremely versatile — positive in action — trouble free — fast operating and can be mounted vertically, horizontally, or at any angle needed for specific machine designs. These Units are also available in 10 H.P. to 40 H.P. capacity to meet requirements.

When head goes from rapid traverse to feed stroke, an electric brake holds leadscrew and shuts off traverse motor — saving wear and tear. "M-15" Units are the answer to high production at lowest cost.

MECHANICAL LEADSCREW FEED

is an exclusive with BAUSH

Many commendable reports have been received from users as to their numerous advantages:

No hydraulic fluid

No fluid leaks or fluctuation in feed

Indirect maintenance costs reduced

Your own mechanic can maintain unit

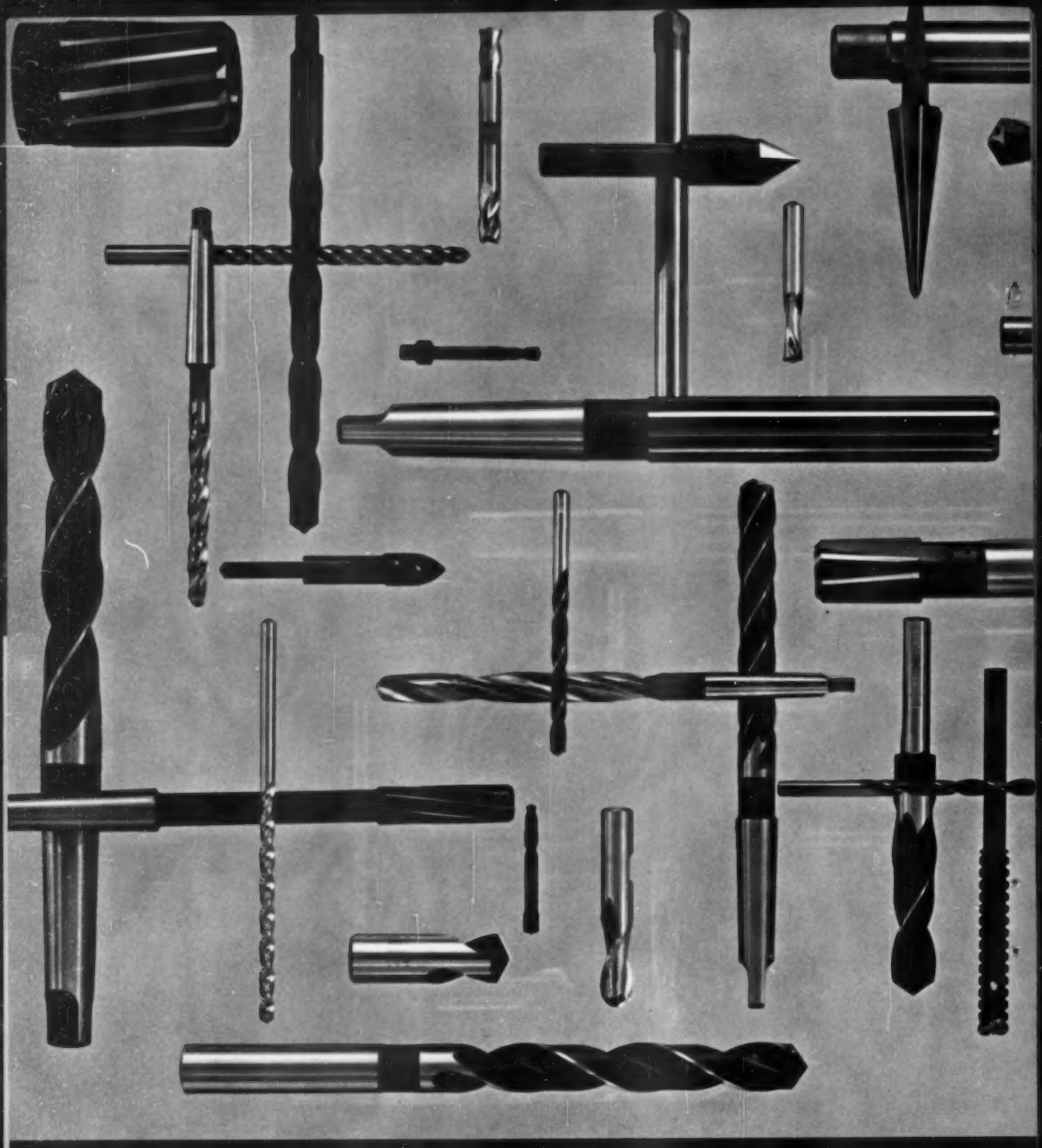
Positive feed thru ball-screw

Break-thru surge eliminated

Drill breakage and part spoilage reduced to minimum.

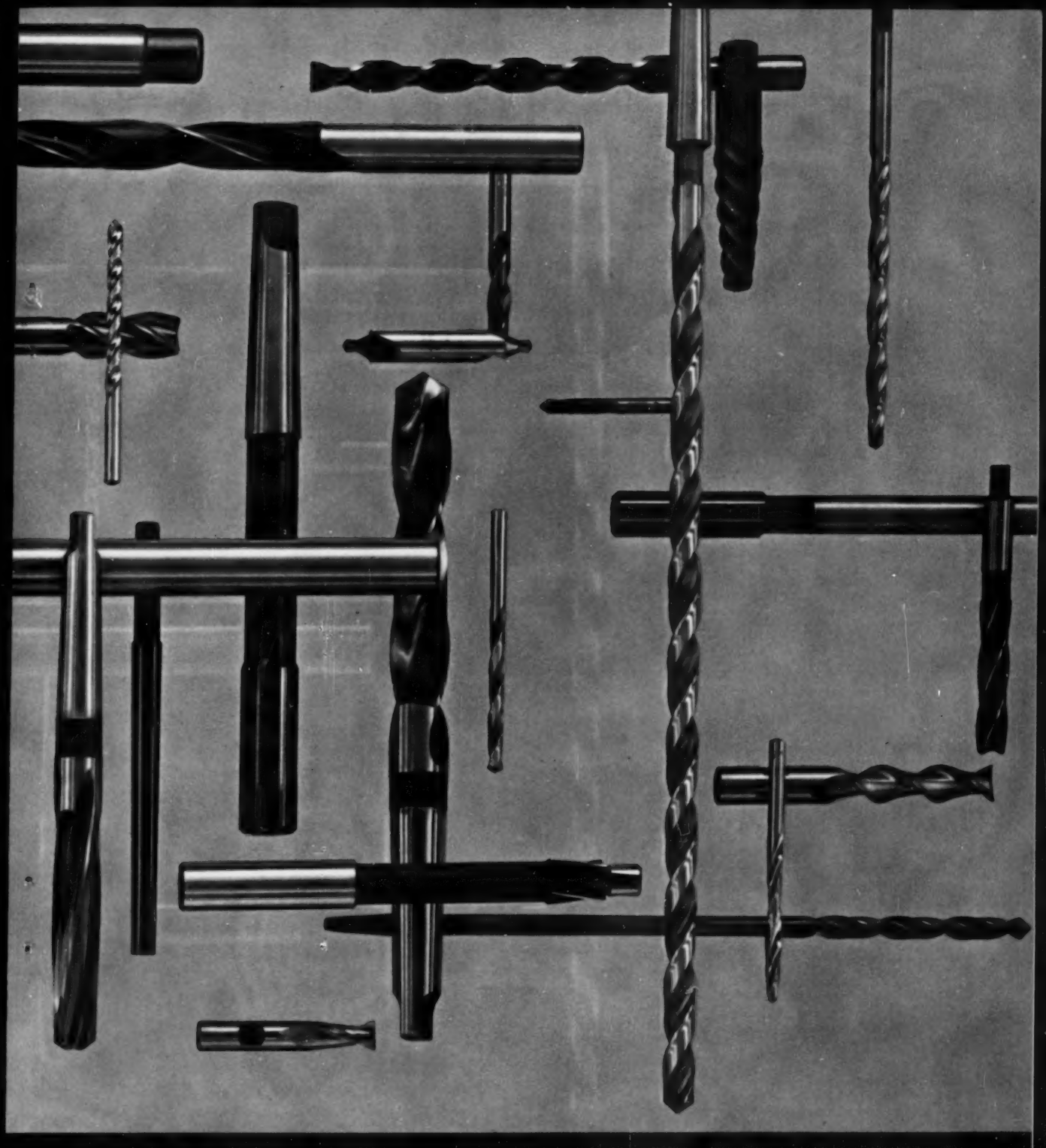
BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

WHITMAN & BARNES Quality Cutting Tools
Produce More Every Hour . . . Every Day . . .
Every Hole At Lower Cost!
WHITMAN & BARNES
MAKERS OF FINE TOOLS SINCE 1868
DRILLS AND REAMERS
40000 PLYMOUTH ROAD • PLYMOUTH, MICHIGAN
NEW YORK CHICAGO LOS ANGELES



WHITMAN & BARNES Cutting Tools

Are More Than Product Lines . . . They're Your Partners in Production Progress



In your constant fight against operating costs, the initial price of cutting tools is NOT your answer—realistic, long-range economy is! With an unequalled selection of application tested standard tools . . . with superior special tools . . . with the best in engineering and technical assistance . . . Whitman & Barnes guarantees to help you secure higher production, improved product quality AND lower production costs!

W&B

HELP ON YOUR CUTTING TOOL PROBLEMS

111 years of experience in the manufacture of fine tools enables us to offer you the best in help for your cutting tool problems. W&B trained cutting tool specialists throughout the country stand ready to assist you with the best applications of standard W&B tools or in the designing of special tools to meet your unusual problems. Just write to W&B or request this service through your W&B distributor. Our representative will quickly contact you.

SEND FOR FACTUAL CASE HISTORY BROCHURE

Actual companies . . . actual applications . . . actual problems. All are detailed in this free brochure. It provides on-the-production-line facts and figures as to how and why Whitman & Barnes cutting tools can effectively cut costs in a wide variety of applications and materials. Just fill in the coupon below for your free copy.

SECURE IMMEDIATE, EFFICIENT SERVICE

Your local W&B Distributor stocks most standard types and sizes of W&B tools. He can give you fast delivery and the best in service. Give him a call today.

SEND FOR YOUR NEW W&B CATALOG

The new Whitman & Barnes Catalog No. 108 is yours for the asking. Its 132 pages contain the latest standards and specifications together with complete technical information.

Just write to Whitman & Barnes on your company letterhead and we will be happy to send you a copy.

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MAKERS OF FINE TOOLS SINCE 1844

DRILLS AND REAMERS

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NEW YORK CHICAGO LOS ANGELES

Whitman & Barnes
Plymouth, Michigan

☐ Please send me your free Case History Brochure.

☐ Please have a W&B representative call to discuss cutting tool problems. No obligation, of course.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

More Milling Possible... Milling More Profitable with FUTURMILL

and a handful of carbide blades

Futurmill's indexable milling cutters converted so many *slow and expensive* machining methods to *fast, low cost* operations, that they established the value of "indexable tooling" . . . recognized as one of today's most important contributions to metalworking progress.

1. Lower cost metal removal

Futurmill takes the burden out of milling with inexpensive indexable carbide blades. No need to remove the cutter from the machine . . . no more cutter grinding and no more delays and lost production time. Index a Futurmill quickly and accurately, right on the machine. Eight times per blade with negative rake cutters and four times with positive. Futurmill's precision ground blades get the finest finish obtainable and more metal removed per cutting edge.

2. Plenty of muscle for any job

The cutter body is a solid one piece construction of heat treated alloy steel . . . not only the most rigid cutter built . . . but precision built.

3. Protection for the cutter body

The case hardened wedges behind the blades absorb the damage in case of an accident and save the cutter body . . . cutting down expense and lost production time for cutter repair or replacement . . . reducing inventory investment. With just a few extra wedges you're back in production.

4. Unobstructed chip clearance

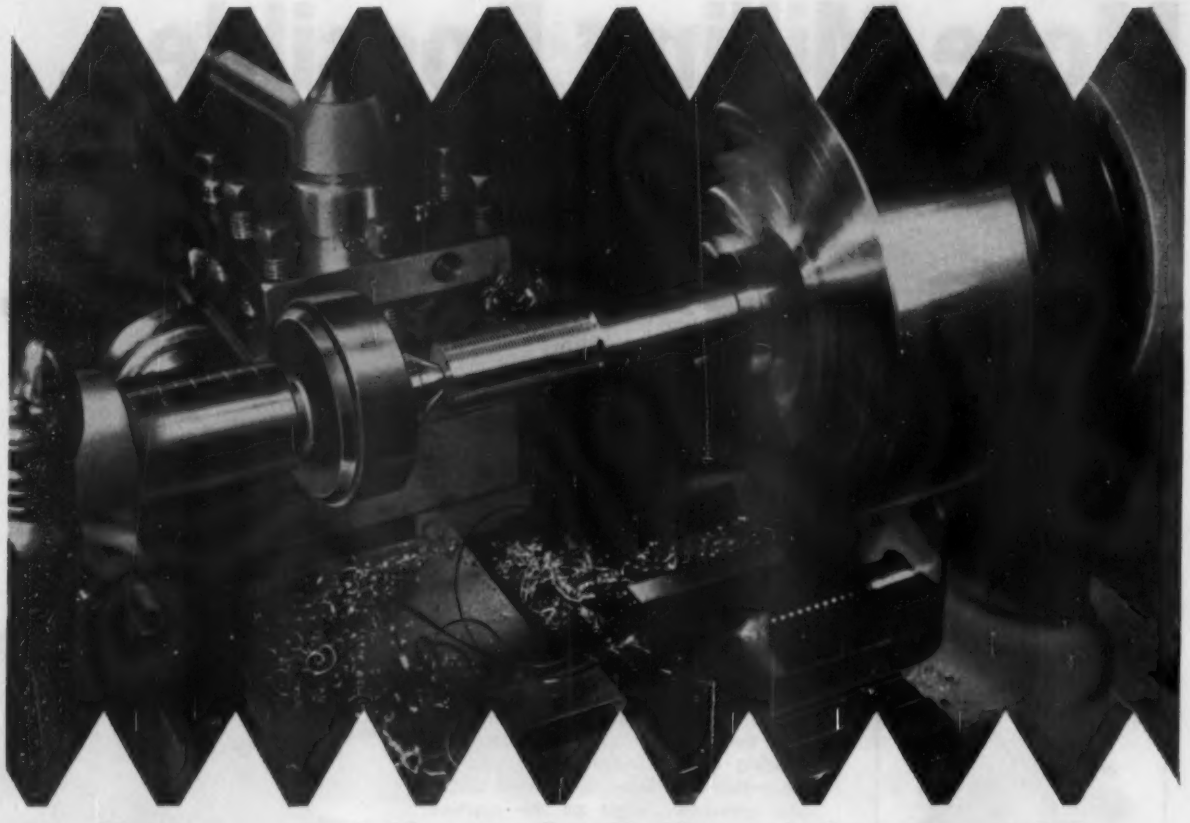
Huge chip pockets in front of the blades direct the chips *out and away* from the cut—critical on steel applications and on deep cuts.

Standard cutter sizes 2" to 24" diameters—positive or negative rakes. Cutters for special applications.

FUTURMILL, INC.

6360 Highland Road • Pontiac, Michigan

In Canada: P.O. Box 95, Dundas, Ontario



Now . . . cut threads 5 times faster with Clausing geared-head lathes

The Clausing-Colchester 13", 15", 17" geared-head lathes equipped with new high speed thread cutting unit—

(1) Cut threads five times faster than by normal methods

(2) Thread tight to a shoulder at maximum speed

(3) Cut internal threads without undercutting

(4) Take full advantage of carbide tools

(5) Minimize rejects

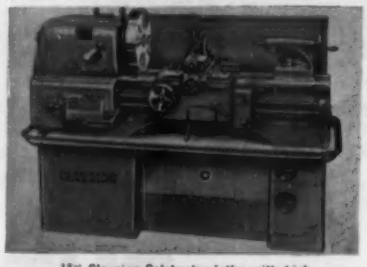
(6) Unit does not restrict normal use of the machine

Cutting a 1½"—16 thread . . . at 1200 RPM . . . is an example of the production obtained with this unit on a Clausing lathe. And you cut precision threads every time! The Hi-Speed Unit contains its own half-nuts and engagement mechanism that eliminates all danger of a thread being "picked up" incorrectly. The tool can't run into the work or chuck—an adjustable stop disengages the half-nuts automatically at the end of the thread.

Clausing geared-head lathes are bigger in capacity. Have larger spindles, larger thru-hole capacity, larger bearings for heavier work. Geared-head is powered thru multiple V-belts. See for yourself the many *plus* features you get in Clausing lathes equipped for high speed thread cutting.

Write for FREE LITERATURE

Operation of the thread cutting unit is simple and fool proof. There's no revolving dial to watch—no manual coordination to require slow speeds.



15" Clausing-Colchester lathe with high speed thread cutting unit . . . only $3,626.

CLAUSING

CLAUSING DIVISION
ATLAS PRESS COMPANY
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1000 records a day—no longer a shipping problem for one of the world's largest transcription companies.

Look what Raleigh ships by Air Express in one day!

Raleigh makes transcriptions—recordings of advertising commercials and pre-recorded programs to be broadcast from many radio stations. There's no margin for error—one slip-up and the sponsor doesn't get what he paid for. Only AIR EXPRESS gives Raleigh Records receipted, on-time delivery—overnight . . . coast-to-coast. The big difference is AIR EXPRESS dependability. It's the nation's most complete air-ground shipping service. One phone call arranges everything—and AIR EXPRESS rates are low. Use AIR EXPRESS—jet-age wings of modern marketing —and you're FIRST TO MARKET . . . FIRST TO SELL.

AIR EXPRESS

CALL AIR EXPRESS DIVISION OF RAILWAY EXPRESS AGENCY • GETS THERE FIRST VIA U. S. SCHEDULED AIRLINES

Non-Magnetic and salt-corrosion-resistant Republic ELECTRUNITE® Stainless Steel Tubing, Type 304, 4½" O.D., was used to fabricate corona rings for a powerful East Coast Navy Radio Station. Despite the rather severe bend of the 15- and 20-foot rings, the fabricator reported no trouble whatsoever. The rings were made in three sections. ELECTRUNITE was bent to the correct radius. Three lugs were welded to each section. The ends were flared for the insertion of a plug used at the erection site to assemble the three pieces into a complete ring and suspend it from towers approximately 1,400 feet high. The fabrication was handled by Jentsch & Company, Inc., Buffalo, New York, subcontractors to Lapp Insulator Company, Leroy, New York.

Bend, Flange, Weld, Easy-to-Fabricate ELECTRUNITE STAINLESS STEEL TUBING

ELECTRUNITE Stainless Steel Tubing and Pipe are available in A.I.S.I. chrome-nickel analyses. Sizes range from ⅜" O.D. to 5" O.D. Pipe sizes are available from ⅛" I.P.S. through 2" I.P.S. in ASA schedule 40S; from ⅛" I.P.S. through 4" I.P.S in schedule 10S; and from ½" I.P.S. through 4" I.P.S. in schedule 5S wall thicknesses.

This fabricator needed a reliable source to supply large diameter heavy wall stainless steel tube for corona rings. From its large size range, Republic was able to provide the proper tube for this vital application.

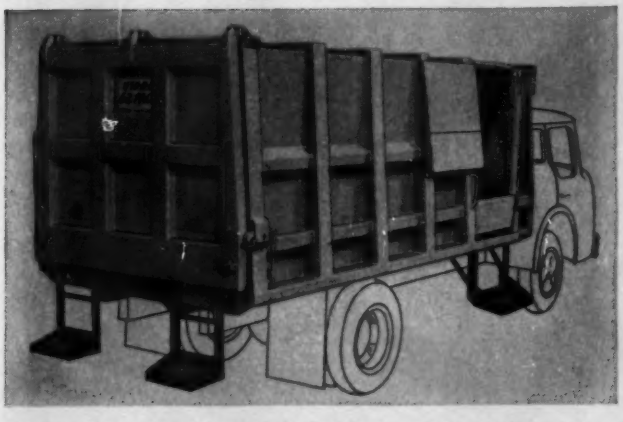
Most experienced welded tube maker, and world leader in the production of stainless and alloy steels, Republic has all the facilities to qualify as your number one source. Complete range of sizes, gages, wall thicknesses. Broad distributor stocks. Large inventories of mill stocks to draw on. Top reputation for quality and for ability to meet deliveries. Technical and metallurgical assistance. Fast service: price and delivery quotations to you within twenty-four hours.

For applications requiring pressure-tested tube, Republic offers exclusive FARROWTEST —the ultimate in non-destructive testing. This eddy-current test probes for and detects defects so minute they pass other, less positive tests. Tube quality is measured for you!

Send in your inquiries for Republic ELECTRUNITE Stainless Steel Tubing and Pipe. You'll like the product . . . and the service.

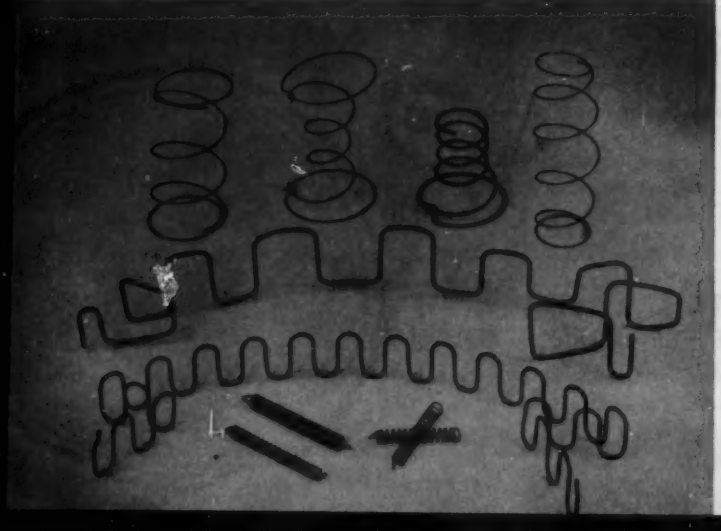
CIRCLE 199 READER SERVICE CARD

REPUBLIC NYLOK® STUDS SOLVE FASTENING PROBLEM for Gravely Tractors, Inc., Dunbar, West Virginia. Problem: Find a dependable fastening method for tractor-attached rotary cultivators. Fasteners must withstand constant shocks and pounding of rotary cultivating. Solution: Use Republic NYLOK Studs. A special nylon insert assures positive locking at any position, even under severe shock, vibration, tension. Prevents all play. Utilizes metal-to-metal contact of opposing threads for locking. Republic NYLOK Fasteners —studs, nuts, cap screws—are re-usable. Nylon insert resists heat, cold, moisture. Mail coupon for facts.



REPUBLIC HIGH STRENGTH STEEL SOLVES WEIGHT PROBLEMS in Hydro E-Z Pack enclosed truck bodies, manufactured by Hercules Galion Products, Inc., Galion, Ohio, for haulers of refuse and garbage. Use of Republic "50" High Strength Steel reduces body weight, permits increased payload on smaller chassis, and the hauler makes fewer trips to the dump. Republic "50" stands up under heavy force of packer blade, resists corrosive action of refuse, and abrasive effects of cans, crates, and other materials. To find out how Republic High Strength Steel can pay off in your application, send coupon.

REPUBLIC STEEL WIRE of consistently uniform quality that assures accurate, easy forming with adequate strength and toughness to meet the most difficult design and forming problems. Strong, ductile, tough, Republic Steel Wire is available in many types and in a wide range of gages and physicals for almost any product you can imagine. The variety of products illustrated above are examples of "imagenuity in wire"—engineering imagination plus modern business ingenuity. Write for more information.



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REPUBLIC STEEL CORPORATION
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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

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☐ Republic High Strength Steels ☐ NYLOK Fasteners
☐ Republic Wire

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Company_____

Address_____

City_____ Zone____ State_____

CIRCLE 200 READER SERVICE CARD

COMPETING WITH A COMPANY WHO GRINDS PARTS UP TO 50% FASTER?

If you are grinding parts like these on other than a Bryant Centalign® you are losing out to competitors who do.

This fact is proven by the many manufacturers who are setting production records and improving their competitive position—with Bryant Centaligns.

Only the Bryant Centalign with its advanced design principles enables you to grind straight bores, tapers and precision bearing raceways with consistent accuracy at record breaking production rates.

Investigate what the Bryant Model "C" Centalign and its tooling, job engineered for quick change over and minimum down time, can do for you.

Inquire, too, about the Bryant Vertical Centalign (for cam-type parts) and the Bryant Model B Centalign for miniature and instrument bearing work.

BRYANT Chucking Grinder Co.

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Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N.Y. • Philadelphia

Internal Grinders • Special Machinery

FOR THAT EXTRA EDGE IN PRODUCTION!

3½ TIMES MORE END MILL PRODUCTION with the New B&S Thriftmill® in Competitive Shop Tests!

20% Lower Initial Cost, Superior Microfinish and Less Downtime also Proved using new B&S Thriftmill.®

TEST DATA

MATERIAL:

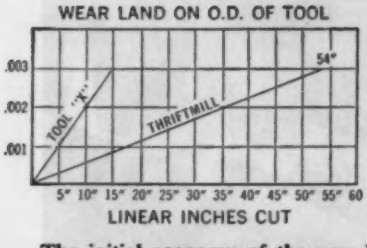
MATERIAL: A1S1-D3 oil hardening tool steel. Hardness, Rockwell C-18.

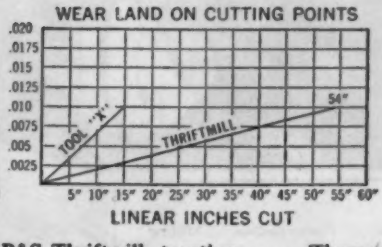
BOTH END MILLS

½" Dia., 4 flute.

CUTTING DATA

	RPM	SFM	CHIP LOAD	TABLE FEED	DEPTH CUT	WIDTH CUT	LENGTH CUT
B&S Thriftmill®	325	43	.00125	1⅝"	¼"	½"	54"
BRAND "X" End Mill	325	43	.00125	1⅝"	¼"	½"	15"





MICROFINISH AFTER TESTS

B&S Thriftmill, bottom of slots, RMS 35.

B&S Thriftmill, sides of slots, RMS 30-38.

BRAND "X" End Mill, bottom of slots, RMS 70-100.

BRAND "X" End Mill, sides of slots, RMS 40-60.

The initial economy of the new B&S Thriftmill, together with the proven production benefits engineered into this fine tool, gives a competitive advantage to all B&S Thriftmill users.

There are 1065 different "standard" off-the-shelf B&S end mills to choose from. End wonder, worry and wait–take advantage of B&S tooling superiority and speedy service–call your B&S Distributor now.

Send for "Condensalog" to: Cutting Tool Division, Brown & Sharpe Mfg., Co., Providence 1, R. I.

Brown & Sharpe
HIGH SPEED STEEL CUTTING TOOLS

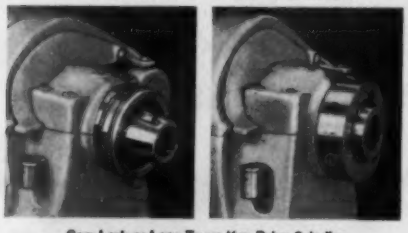
NELCO
CARBIDE CUTTING TOOLS

ACCURACY
to keep machining economical

SOUTH BEND 14½" LATHES

Tolerances don't dictate slow-ups when you are using these precision lathes. Their accuracy, smoothness and operating ease save time as well as material on the tough jobs. With proper tooling, work can often be machined with such precision and smoothness that subsequent grinding, honing or lapping operations may be eliminated. Dollar-for-dollar you get more in South Bend Lathes. Write for catalog now and find out how South Bend Lathes can lower your machining costs.

OPTIONAL FEATURES



Cam Lock or Long Taper Key Drive Spindles to provide greater interchangeability of chucks, collets and fixtures.

Hardened—Ground Bed Ways to resist wear and scoring under severe conditions.

SPECIFICATIONS

SWING: 14⅛" over bed and saddle wings.

DISTANCES BETWEEN CENTERS: 24" to 60".

COLLET CAPACITY: 1 1/16".

SPINDLE SPEEDS: 6, 8, 12 or 16. 3-step cone pulley optional at no extra charge.

FEEDS: 48 each—longitudinal, cross and thread cutting.

BASE PRICE: $2074 f. o. b. factory.

South Bend Lathe, South Bend 22, Indiana

Send literature on ☐ 14⅛" Lathes, ☐ 9" to 16-24" Lathes, ☐ Turret Lathes, ☐ Milling Machines, ☐ Shapers, ☐ Drill Presses, ☐ Pedestal Grinders.

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Up to 36 months to pay.

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Building Better Tools Since 1906

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the complete line Butterfield drills are produced with skill and delivered with speed, like all other Butterfield tools: taps, reamers, dies, counterbores, cutters, end mills, hobs and carbide tools. Phone for these, or for technical aid. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

BUTTERFIELD

DIVISION, Union Twist Drill Company, Derby Line, Vt.

FROM CREATIVE CRUCIBLE: HIGH SPEED STEELS THAT MAKE BETTER TOOLS POSSIBLE

UNGROUND CLASS "C" HOBS, *made from Crucible's M2S, consistently meet runout tolerances as required.*

CIRCLE 205 READER SERVICE CARD

ACCURATE HOBS— WITHOUT GRINDING!

Toolmakers hold hob tolerances to less than 0.001" without finish grinding—because of improved manufacturing skills and continually improved Rex® High Speed Steels.

Today's toolmakers are not only producing accurate unground hobs to closer tolerances – they're also making them stronger, longer-lasting and with fewer grinding stresses.

What is behind this development? It's the skill of the toolmakers – combined with continuing Crucible developments that improve the quality of Rex High Speed Steels. Crucible tool steel metallurgists, working closely with producers of fine precision tools, are able to devise mill manufacturing practices to provide steels ideally suited to specific applications.

At Crucible, Rex High Speed Steels have always been produced under the close personal supervision of the most experienced men in the industry. Today, these men utilize the most advanced electronic instrumentation to assure the production of highest quality steels. For example, they use precision instruments to control the temperature of the molten metal, in the melting furnace, so each heat is produced under identical conditions. New techniques permit greatly improved deoxidation of the liquid steel. New ingot mold designs provide freedom from segregation when the steel solidifies. And all Rex High Speed Steel billets are inspected ultrasonically before they are rolled or forged.

As a result, Rex High Speed Steels continue to make the best hobs because they offer:

more uniform distribution of carbides throughout the section. This ensures minimum size change, greater predictability in heat treatment, greater hardenability and more uniform hardness in the heat-treated tool:

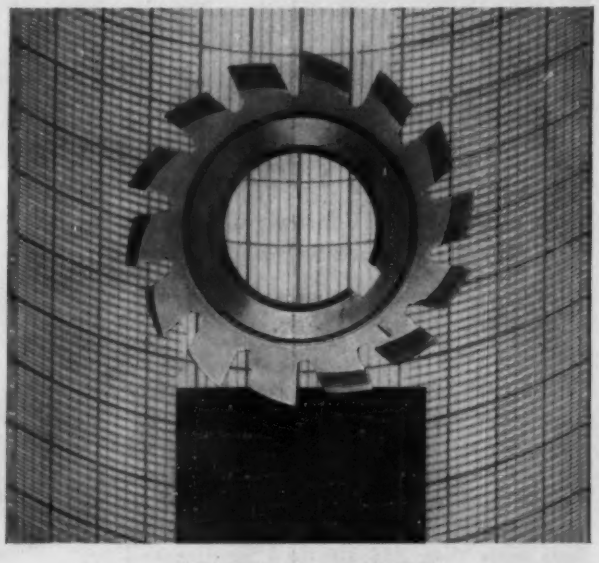
more uniform distribution of sulfides in the free-machining grades. And this provides improved machinability and superior surface finish.

Single-Thread Gear-Hob Tolerances (in Ten Thousandths of an Inch)

	DIAMETRAL PITCH										
	1 Thru 1.999	2 Thru 2.999	3 Thru 3.999	4 Thru 4.999	5 Thru 5.999	6 Thru 8.999	9 Thru 12.999	13 Thru 19.999	20 Thru 29.999	30 Thru 50.999	51 and Finer
RUNOUT											
Outside Dia. C	50	45	40	25	20	17	17	12	12	10	8

Table: Metal Cutting Tool Handbook

FINAL PROOF OF A HOB'S ACCURACY. *This lead variation chart, produced by a special electronic recorder, provides a check of every tooth in the hob. Checks are made "against perfection" — so, any deviation shows up on the chart. Photomicrograph shows tooth area's structure and the uniform distribution of carbides in Crucible Rex M2S. (Photo: 100X dia.)*



BETTER TOOLS, THROUGH BETTER STEELS. *The constant improvement of Rex High Speed Steels ensures the increasingly greater performance of fine twist drills, taps, broaches and cutters — as well as hobs.*

CRUCIBLE STEEL COMPANY OF AMERICA

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CIRCLE 206 READER SERVICE CARD

"Custom" milling machines

TYPE OF MACHINE	Heads			Tables		Saddle	Columns		Controls		
	Vertical	Horizontal	All-Angle	Horizontal	Rotary		Fixed	Cross Travel	Pendant	Tracer	Tape
1 SIMPLEX		•		•			•	•	•	•	•
2 DUPLEX		•		•			•	•	•	•	•
3 TRIPLEX	•	•		•			•	•	•		
4 UNIVERSAL BED TYPE		•	•	•			•	•	•	•	•
5 VERTICAL	•			•	•	•	•	•	•	•	•
6 ROTARY TABLE	•	•			•		•	•	•	•	•
7 OMNIMIL			•	•		•	•		•	•	•
8 RAIL TYPE	•			•			•		•	•	•

STANDARD POWER MOVEMENTS SHOWN BY ARROWS . . . OTHERS AVAILABLE (OPTIONAL)

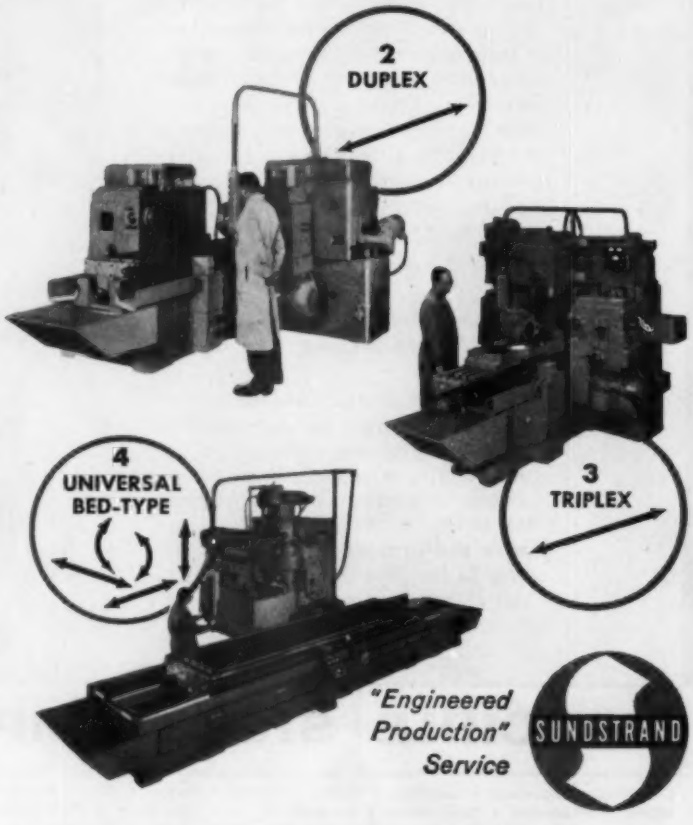
Sundstrand Unit Construction Gives You The Right Machine For The Job.

Look at the Sundstrand line pictured here — it offers you special machine productivity at standard machine cost!

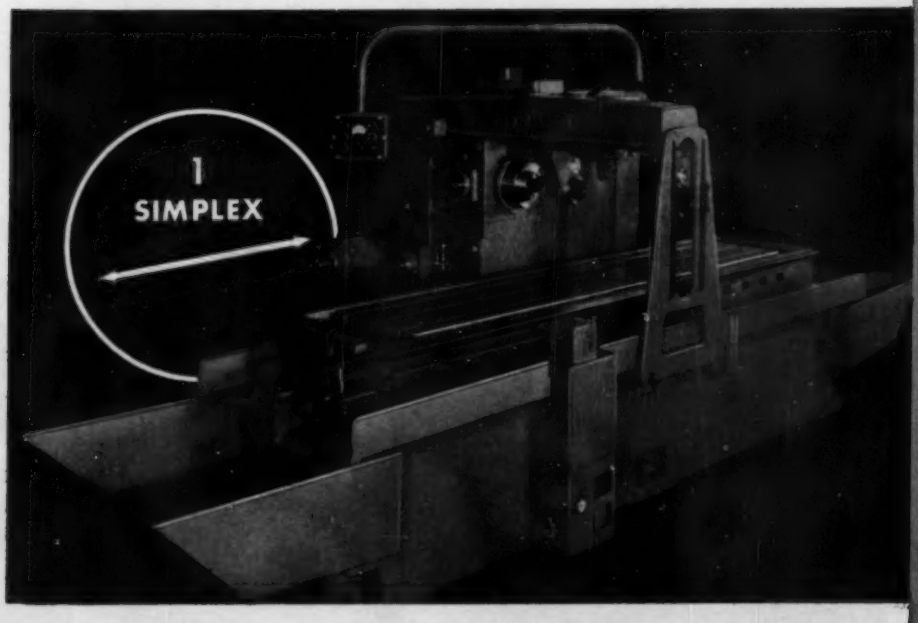
Sundstrand design engineers have created unit heads, tables, columns, and other elements in sizes, types, and horsepowers to provide an almost unlimited range of combinations to exactly meet your production requirements. For example, Sundstrand catalogs more than 138 standard Simplex and Duplex machines, not including the variations shown in the table above. Attachments such as vertical feed to horizontal heads, power feed to quills, automatic index bases, etc. provide additional cycle combinations.

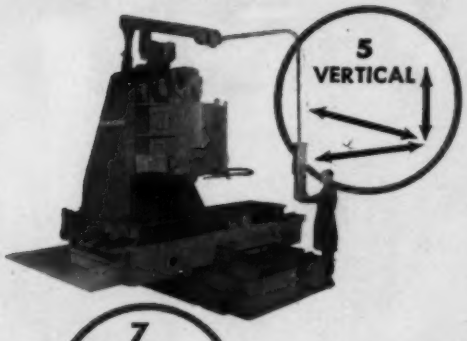
Sundstrand application engineers offer you "Engineered Production" service that helps you "put together" the versatile machine that best meets your needs. And you get extra protection against obsolescence because if your work requirements change, you can modify the machine by changing the head.

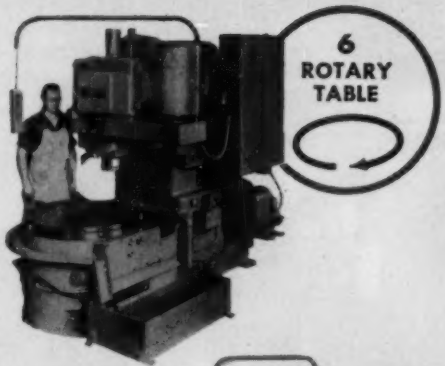
For complete information and literature, write today.

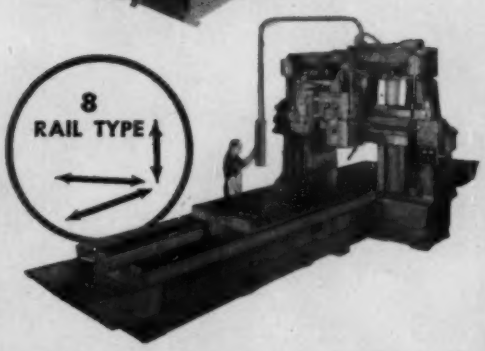


from standard components









SUNDSTRAND MACHINE TOOL

DIVISION OF SUNDSTRAND CORPORATION

BELVIDERE, ILLINOIS

SUNDSTRAND

More facts about

SUNDSTRAND

"Engineered Production"

Literature listed under various machine types has more details. Write Sundstrand for your copy today.

Automatic and Tracer Lathes

Engineered Milling Production

Examples of Transfer Machines

Multiple-spindle Drilling Machines

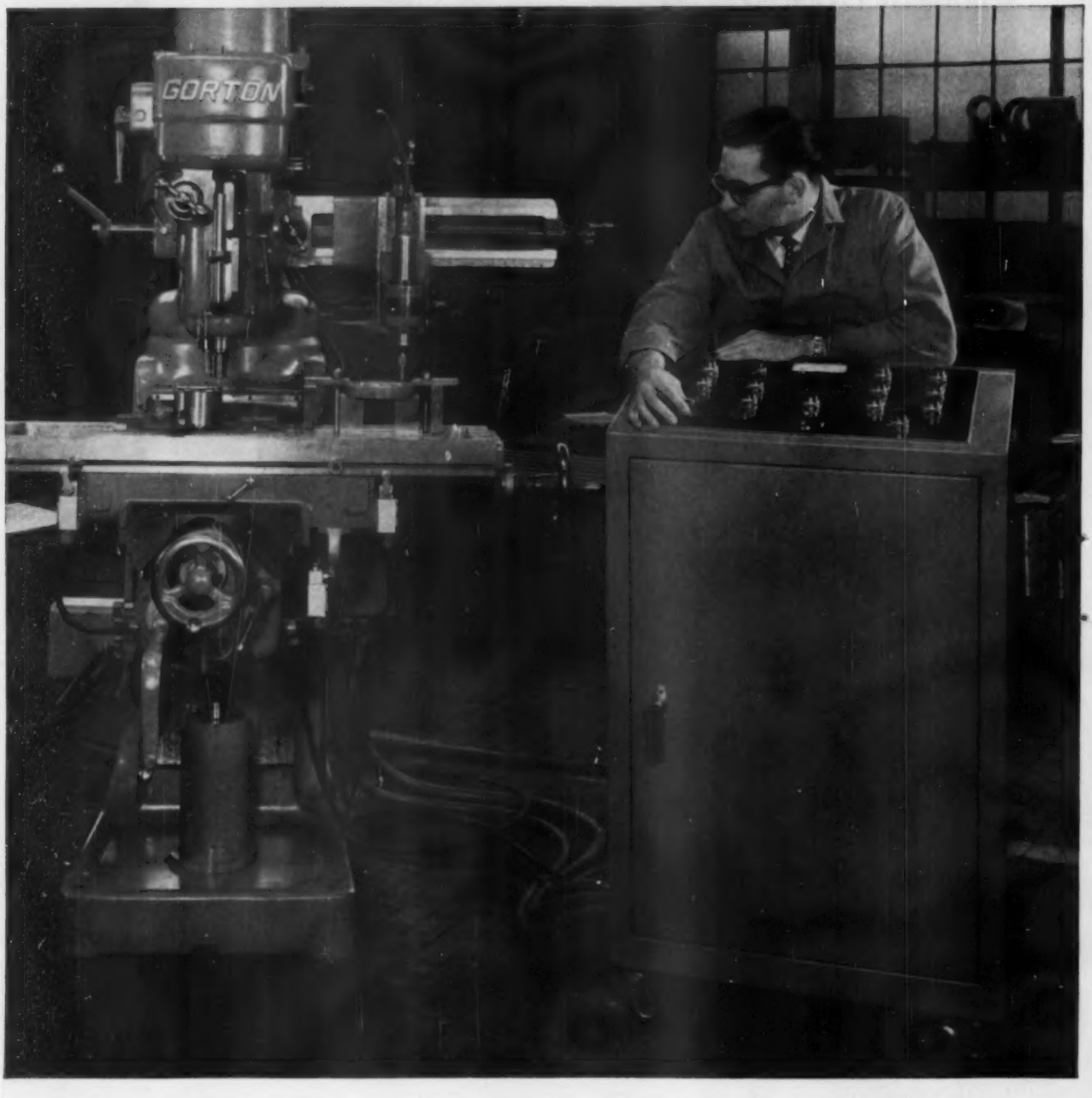
Internal and Rotary Surface Grinders

Broaching Tools

Precision Broaching Methods

Thread Milling

For automatic tracing Gorton's AUTO-TRACE is



with accuracy to .001″ Honeywell-equipped

Using a Honeywell control system, this electro-hydraulic 180° duplicator does 3-dimensional scanning jobs faster and to closer tolerances automatically!

You get machine hours without manhours using the Gorton Auto-Trace with a Honeywell Tracer Control system. One piece or a production run—part to master, or part to part, you get the same close tolerances *every* time. The human element of error is entirely eliminated, once the set-up is completed and the machine takes over. In the field of dies and molds, pattern making and milling of intricate convex and concave surfaces, here is mechanical logic at its best!

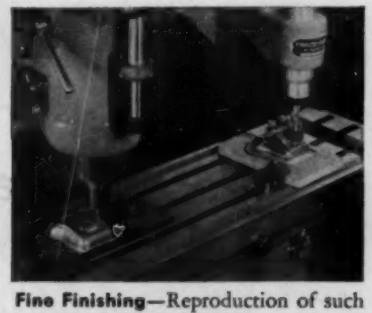
The Gorton Auto-Trace and Honeywell Tracer Control system give you push-button ease and versatility. A deflection meter on the console eliminates costly test cutting. A push-button transforms the deflection meter into a feed-rate read-out. Automatic compensation of feed rates makes it possible to use small cutters and tracing styles with complete safety. An increment cross-feed makes possible continuous cutting in both directions. And an exclusive Area Control eliminates non-productive over-runs.

Honeywell Tracer-Control systems have proven to be very compatible with Gorton Milling Machines in every respect. Each Honeywell system becomes an integral part of the machine tool and, due to the adaptability and sensitivity of electronics, the control system can be adjusted to an individual machine or machine type.

For greater productivity and better quality jobs at far less cost, see your machine tool manufacturer about a Honeywell system to meet your needs. We'll be happy to make recommendations to him regarding the 180° system for die-sinking. The 360° model for production jobs is also available. For further information about Honeywell's complete line of machine control systems, write Minneapolis-Honeywell, Minneapolis 8, Minnesota.

Accuracy—This sealed-beam headlight die is typical of the difficult contours and facets which can be reproduced accurately with minimum monitoring.

Flexibility—Due to light stylus pressure, master dies for plastic molds can be made from easily formed materials such as wood, plaster of paris and plastic.



Fine Finishing—Reproduction of such ornate and detailed designs as this casket hardware is a job easily within the scope of the Gorton 180° Auto-Trace.

Honeywell

First in Control

Columbium
makes possible
this unique
new
fine-grained
carbon steel

GLX-W

Compare fine-grained GLX-W with the steel you use

Great Lakes adds a precise amount of columbium to good-quality carbon steel. The result is fine-grained GLX-W steel. Here's how GLX-W compares with mild carbon steels . . .

- GLX-W is 50-100% stronger
- Has greater notch toughness
- Has excellent weldability
- Is as ductile as other carbon steels
- Permits designers to reduce weight up to 35%.

For proof on how GLX-W can cut your production costs, write, wire or phone Great Lakes Steel Corporation, Product Development Division, Department X.

GLX W **GREAT LAKES STEEL**
Detroit 29, Michigan

Great Lakes Steel is a Division of **NATIONAL STEEL CORPORATION**

LeBLOND of Cincinnati

CUSTOMER

THIS CERTIFIES THAT THERE IS ON

TOM RAGSDALE SAYS, "I Make Money

"In my job shop in Denver I have twelve LeBlond Lathes, six of them purchased in the last year. LeBlond Lathes are the best dollar investment I can make."

Tom Ragsdale

L 315 723 349 A

On receipt of this advertisement, before August 1, 1960, the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio will deliver a valuable and useful article to the sender.

THOMAS A. RAGSDALE

Vice President, Ragsdale Bros. Tool & Die, Inc., Englewood, Colo.

LeBLOND of Cincinnati

THE R.K. LeBLOND

"Having a new LeBlond is better than having the cash." Call a LeBlond representative or ask a LeBlond owner.

TESTIMONIAL

LeBLOND of Cincinnati

DEPOSIT AT LEBLOND A LETTER WHICH READS . . .

With LeBlond Lathes"

"Tom Ragsdale tells me that his LeBlond Lathes give him a definite advantage over his competition. It's things like this that make me proud I sell LeBlonds."

R. E. DuBoc

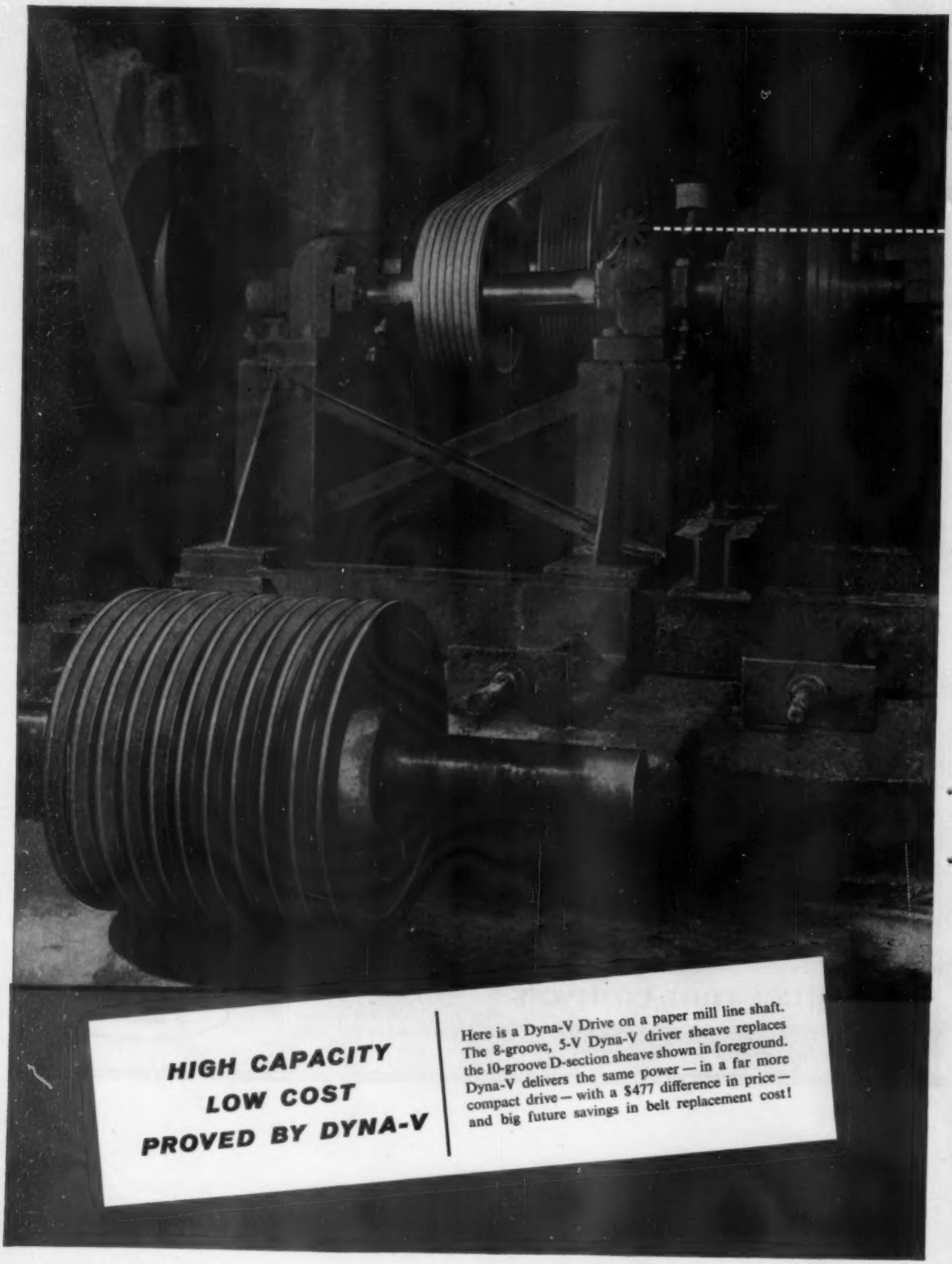
R. E. DUBOC

President, R. E. Dubec Associates, Denver, Colo.

MACHINE TOOL COMPANY

LeBLOND of Cincinnati

The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio

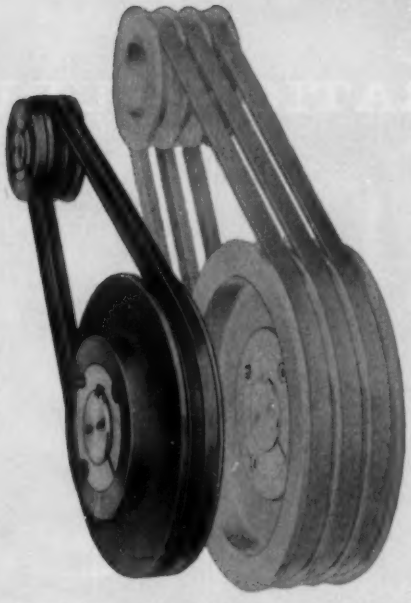


HIGH CAPACITY
LOW COST
PROVED BY DYNA-V

Here is a Dyna-V Drive on a paper mill line shaft. The 8-groove, 5-V Dyna-V driver sheave replaces the 10-groove D-section sheave shown in foreground. Dyna-V delivers the same power — in a far more compact drive — with a $477 difference in price — and big future savings in belt replacement cost!

Dyna V

THE NEW MONEY-SAVING IDEA IN V-BELT DRIVES!



Dyna-V compared with big-groove drive for same hp. Dyna-V is capable of handling 3 times as much hp in the same space! Dyna-V Drives are available for capacities from 1 to 1500 hp.

The day of big-groove sheaves and belts is passing. The new idea of compact V-belt drives—Dyna-V—introduced by Dodge just a few short months ago, is taking the country by storm. Thousands of Dyna-V Drives are at work in industry everywhere, carrying their loads easily, dependably, and proving their ability to *deliver more horsepower per dollar!*

Dyna-V utilizes the full performance possibilities of today's great synthetic fibers for belts—and modern metals for sheaves. Narrow belt top widths team up with narrow sheave grooves to create Dyna-V compactness. Narrow grooves reduce face width—save weight. Costs are lowered. Smaller diameter sheaves and shorter center distances multiply savings. With Dyna-V you cut costs on most initial installations and economize on belt replacements as well. In medium and high hp ranges these savings can be as much as 30%.

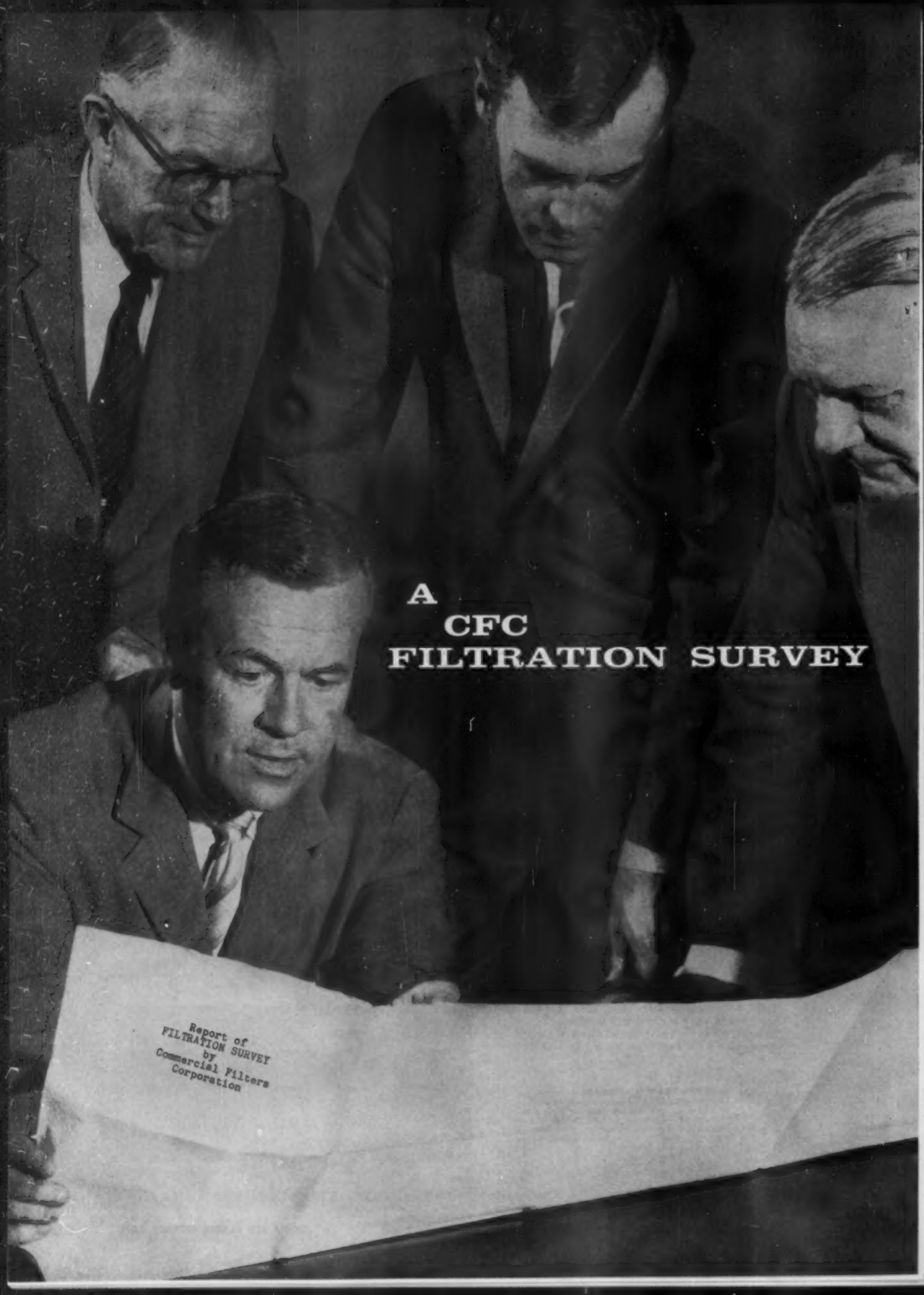
Dyna-V Sheaves decrease shaft overhang—increase bearing life. And Dyna-V Belts possess all premium qualities. Conditions requiring oil, heat, moisture resistance or static conductivity are met by Dyna-V's one grade—the finest. Ask your local Dodge Distributor. Or write us for Dyna-V Bulletin.

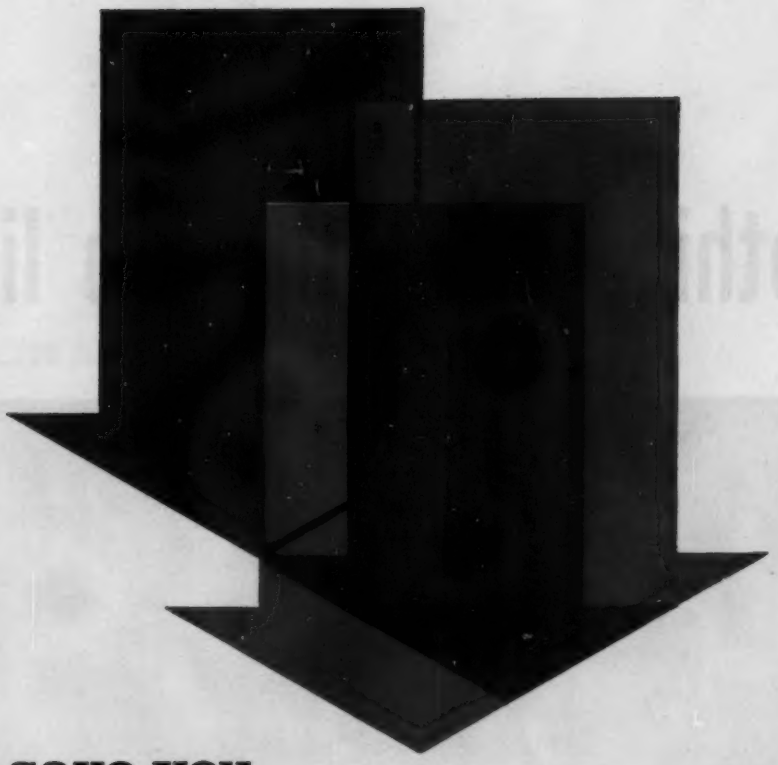
CALL THE TRANSMISSIONEER — your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the *white* pages of your telephone directory, or in the yellow pages under "Power Transmission Machinery".

DODGE

of Mishawaka, Ind.

DODGE MANUFACTURING CORPORATION, 100 UNION STREET, MISHAWAKA, INDIANA


A
CFC
FILTRATION SURVEY
Report of
FILTRATION SURVEY
by
Commercial Filters
Corporation



. . . may save you thousands of dollars

Wherever industrial fluids . . . chemicals, gases, oils, water . . . are used in processing and production, CFC micro-filtration can bring you substantial savings.

Versatile CFC Filtration Equipment provides continuous micro-clarity for all types of industrial needs . . . results in improved product quality, lower maintenance and production costs, and decreased downtime.

At no obligation, a qualified CFC Filtration Engineer will survey your plant and recommend micro-filtration wherever it will save you money. Write to Dep't. AM.

Filter out high costs . . . ***with CFC Filters***

CFC

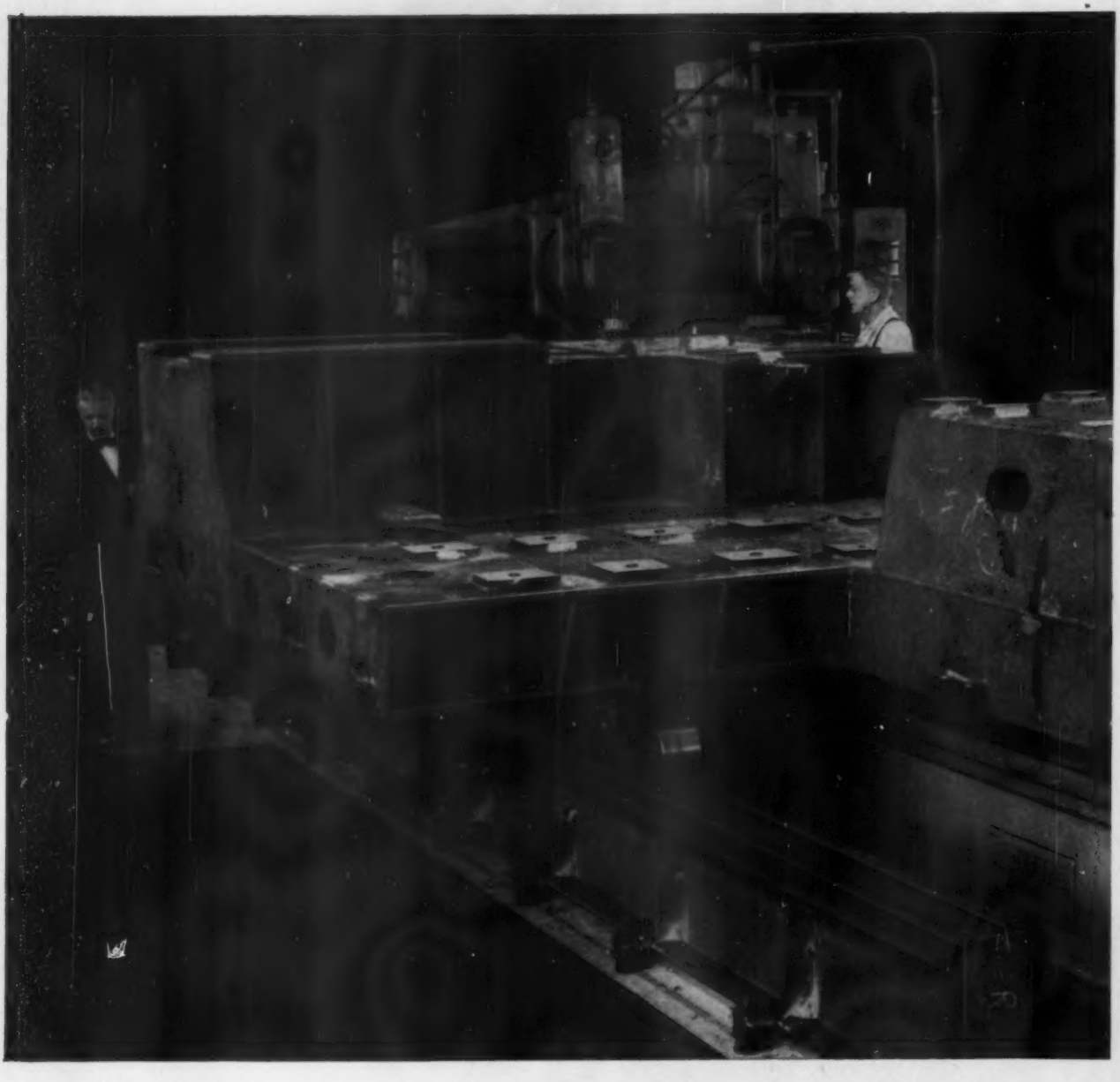
COMMERCIAL FILTERS CORPORATION

Fulflo Honan-Crane Delpark Michian

MELROSE 76, MASSACHUSETTS

PLANTS IN MELROSE, MASS. AND LEBANON, IND.

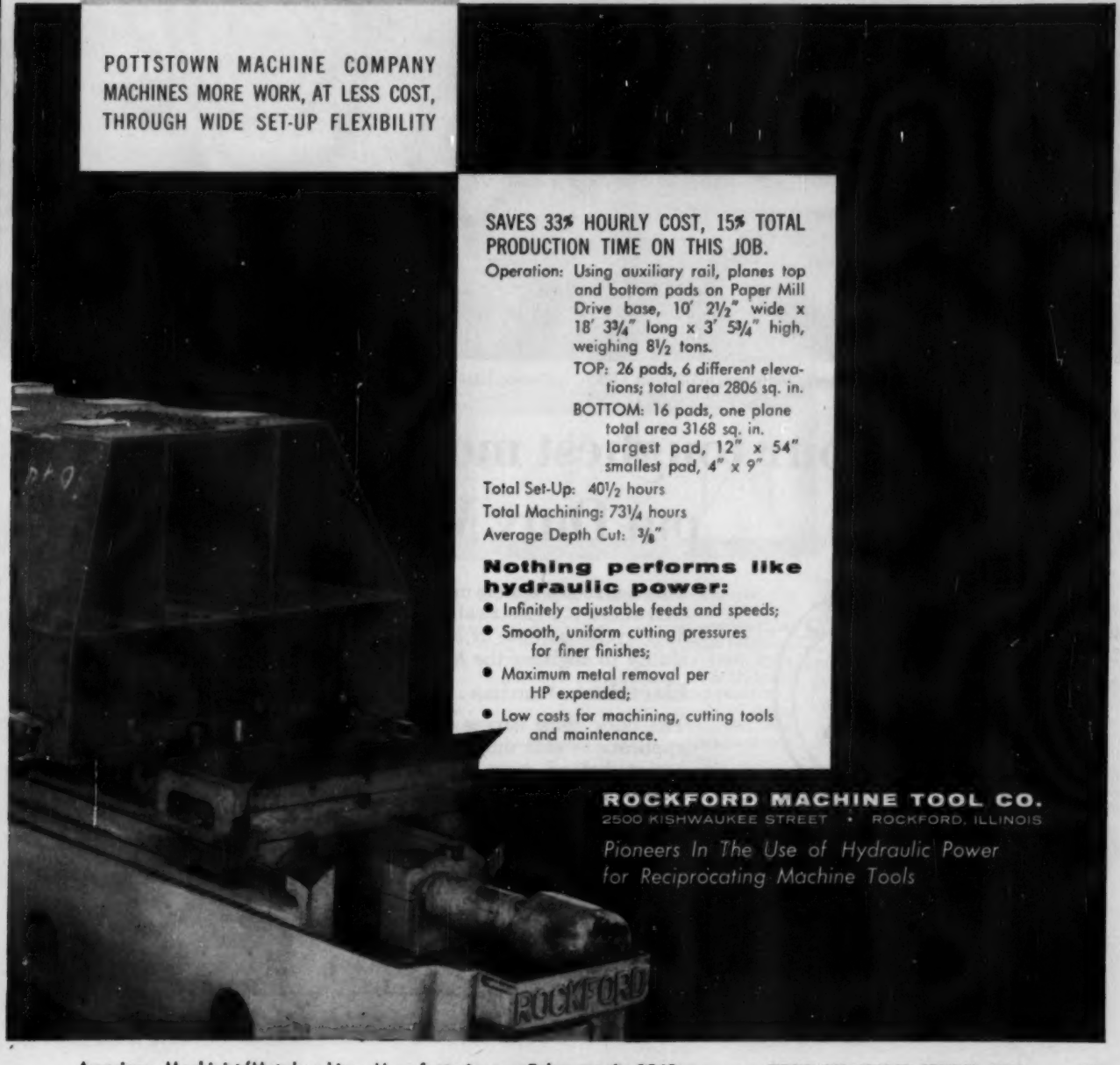
Nothing does the job like a...



ROCKFORD

... HYDRAULIC PLANER

POTTSTOWN MACHINE COMPANY MACHINES MORE WORK, AT LESS COST, THROUGH WIDE SET-UP FLEXIBILITY



SAVES 33% HOURLY COST, 15% TOTAL PRODUCTION TIME ON THIS JOB.

Operation: Using auxiliary rail, planes top and bottom pads on Paper Mill Drive base, 10′ 2½″ wide x 18′ 3¾″ long x 3′ 5¾″ high, weighing 8½ tons.

TOP: 26 pads, 6 different elevations; total area 2806 sq. in.

BOTTOM: 16 pads, one plane total area 3168 sq. in. largest pad, 12″ x 54″ smallest pad, 4″ x 9″

Total Set-Up: 40½ hours

Total Machining: 73¼ hours

Average Depth Cut: ⅜″

Nothing performs like hydraulic power:

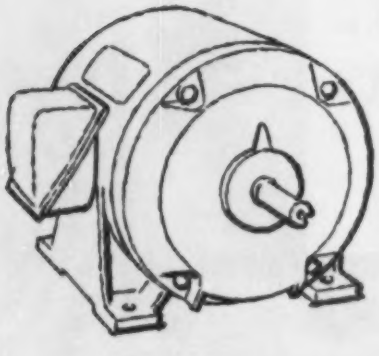
- Infinitely adjustable feeds and speeds;
- Smooth, uniform cutting pressures for finer finishes;
- Maximum metal removal per HP expended;
- Low costs for machining, cutting tools and maintenance.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Pioneers In The Use of Hydraulic Power for Reciprocating Machine Tools

R. L. Potter, Sales Engineer, Pittsburgh District Office, Reliance Electric and Engineering Company.

"Think of your toughest motor job...then put Duty Master to work!



"This a-c. motor stands up to the more extreme forms of industrial abuse . . . electrically and mechanically. It meets rugged duty cycles because of *built-in protection* . . . plus Reliance's ability to engineer the motor to any unusual application.

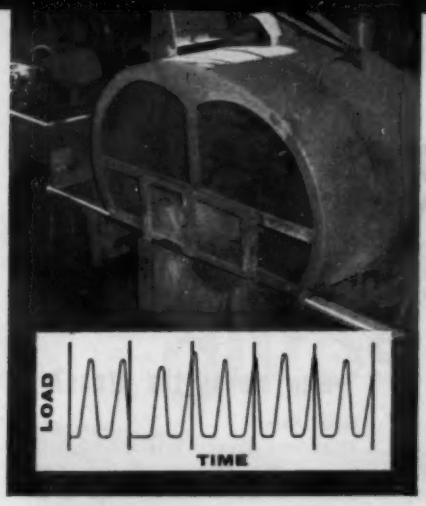
Electrical stamina . . . mechanical strength.

"The duty cycle curves demonstrate a wide range of rough applications that only a really good motor—Duty Master—can withstand over extended periods. The pictures reveal adaptability to modification and conversion. You can't beat proof that Duty Master's design can wholly meet special problems."

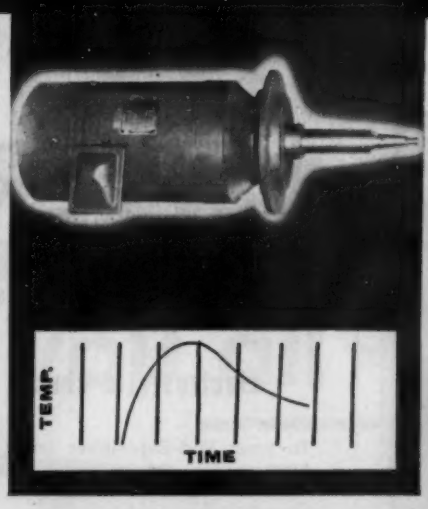
Duty Master is available now—1 through 250 hp.

RELIANCE — Duty Master A-C. MOTOR

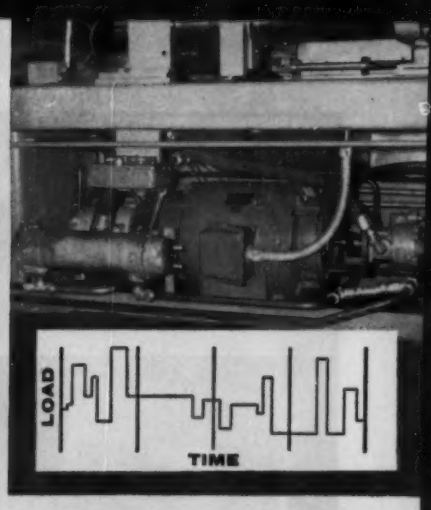
CIRCLE 221 READER SERVICE CARD



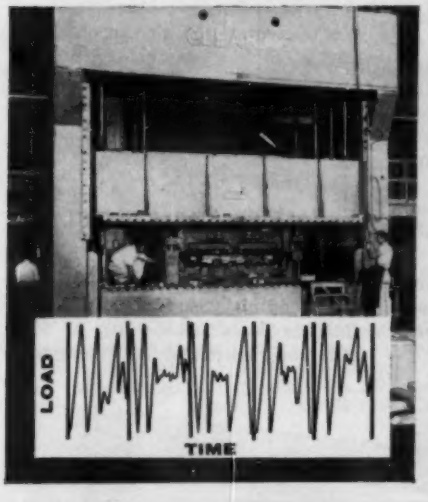
Hot Saw Motor: Duty Master powers a saw cutting 40 foot lengths of red-hot 4" diameter tubular steel moving at speeds up to 2000 feet per minute. Tremendous gyroscopic loads are exerted on bearings and rotating assembly by a rapidly circling saw arm. The motor is equipped with extra strength bearings, as well as a special oil mist lubrication system, in order to maintain continuous resistance to unusual operating pressures.



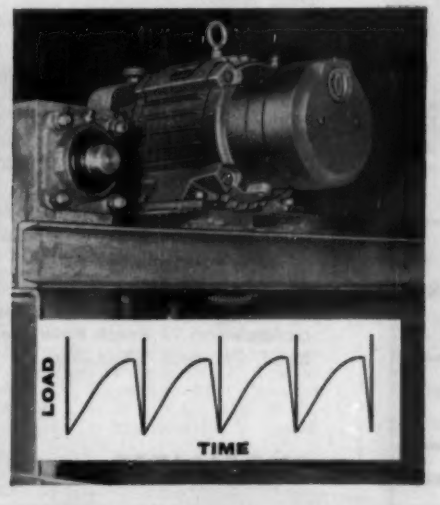
Furnace Fan Motor: Placed outside an annealing furnace, Duty Master uses a bi-metal shaft in driving fan inside. Bi-metal properties of the shaft reduce 2000°F. furnace temperature to bearing temperature. Special motor cooling design takes care of shaft expansion, supplies sufficient cooling to protect bearing adjacent to the furnace. Motor takes high overloads at the start due to low temperature air present as furnace begins operation.



Hydraulic Pump Motor: Injection molding machine shown is operated by a Duty Master close-coupled, double-end assembly. Necessary 25 hp. rating installed in limited space was accomplished using Class F insulation which permitted smaller frame size. Thus, this converted standard stock motor does the necessary job in a space which prohibited foot mounted pumps. Actually the unit cost is lower with this new application.



Press Motor: This powerful high torque, high slip motor accelerates to top speed and stops . . . in 4 seconds, and repeats the cycle 14 additional times in the same minute! Directly connected to the *press* action, this Duty Master Motor is insured against failure and downtime by better thermal storage capacity of the rotor . . . a new, efficient design feature.



Baling Motor: Reliance engineered the motor to the baling process, having established that previous applications were over-horsepowered under full load. A Duty Master 40 hp., 1800 rpm. motor runs continuously . . . is clutched and de-clutched to raise and position a weight in baling fixed tonnage of metal scrap. Motor leans into maximum load, is then released, as curve demonstrates.

The basic advantages of Duty Master stem from its sound design and engineering . . . from the inside out. Regardless of the ways in which you use this motor, Duty Master *will perform*... to your satisfaction.

Put Duty Master's protection, strength and convertibility to work for you. Reliance Sales Engineers can show you that, regardless of demanding applications, Duty Master pays off in long-term, dependable performance. We suggest also that you write for the new Duty Master Bulletin, No. B-2106.

B-1678

Product of the combined resources of Reliance Electric and Engineering Company and its Master and Reeves Divisions

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 31A, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in Principal Cities

Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V*S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

CIRCLE 222 READER SERVICE CARD

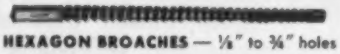
Why pay for "SPECIALS" when you can get these STANDARD BROACHES from STOCK

Minute Man
KEYWAY BROACH KIT

In one minute and for as little as one cent you can cut a keyway with the Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

SAVE TIME AND MONEY WITH THESE OTHER STANDARD STOCK BROACHES

SQUARE BROACHES — 1/8" to 3/4" holes



HEXAGON BROACHES — 1/8" to 3/4" holes

ROUND BROACHES — 1/4" to 1" holes

SEND FOR CATALOG AND PRICE LIST

The duMont Corp.
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

LETTERS

to the editors 330 W 42nd St, NY 36, NY

Electrostatic chuck

Dear Sirs:
In your Mid-September issue of 1959 under "Materials & Components," you reported on a "magnetic chuck for holding nonmagnetic materials" using electrostatic force (p452).

I would appreciate learning where more information or samples of this material may be obtained.

Wilson O'Brien
Cincinnati, Ohio

Dear Sirs:
We are interested in obtaining the name of the manufacturer of the electrostatic chuck for nonmagnetic chucking as described in your article (*AM* — Feb 9 '59, p91).

Your help will be greatly appreciated.

A P Manino
Palo Alto, Calif

Additional information can be secured from R E Munger, Electroforce Inc, 75 North Pine Creek Road, Fairfield, Conn—Ed.

Who makes the press?

Dear Sirs:
That was a very interesting article on the gearless flying press installed at Westinghouse Electric Corp's Standard Controls Division (*AM*—Jan 11 '60, p80).

However, nowhere in the article was the name of the manufacturer of the press mentioned.

Would you please supply us with this information?

C G Hockett
chief production engineer
Fram Corporation
Providence, RI

We apologize for the oversight. The press is a product of Wean Equipment Corp, 22800 Lakeland Blvd, Cleveland 17, Ohio, and the man to contact is W A Brown, advertising manager—Ed.

Carbide impregnator

Dear Sirs:
In "Metalworking Report," under the heading, "Build Your Own Carbide Tools" (*AM*—July 27 '59, p2), you mentioned the Wickman

SHOPMATES

N. Jarvis

CRACKPOT IDEA IF EVER I SAW ONE!! WON'T WORK!! WRONG PRINCIPLE OF POWER INDUCTION!! CALL THESE DRAWINGS?? MORE LIKE CARTOONS!! WHO MADE THIS MESS?? THE GUY BELONGS IN A LOONEY BIN!!
MAC SMART OUGHTA LOOK AT THEM PRINTS— THEY GOT THE WHIP'S NAME ALL OVER 'EM!!
N. JARVIS

SIMONDS
gives you all

1. OIL HARDENING FLAT GROUND DIE STEEL

Simonds quality-controlled tool steel . . . precision ground . . . ready-to-use . . . comes in 1001 stock sizes for 1001 uses: punches, dies, machine parts, small tools, etc. Spheroidize-annealed for best machinability. 18" and 36" lengths . . . flats and squares . . . individually packaged. A.I.S.I. or S.A.E. Type No. O1. *Chemical Analysis:* C .85-.95, Mn 1.00-1.25, Si .20-.40, Cr .40-.60, W .40-.60, V .10-.20.

2. AIR HARDENING FLAT GROUND DIE STEEL

This 5% chrome, spheroidize-annealed tool steel has exceptional wear-resistant qualities yet is easy to machine and heat treat. Ground to accurate dimensions . . . suitable for a multiplicity of uses . . . individually packaged in a wide range of stock sizes . . . flats and squares . . . standard 36" lengths (18" lengths also furnished, if desired). A.I.S.I. or S.A.E. Type No. A2. *Chemical Analysis:* C .95-1.05, Cr 5.00-5.50, Si .30-.50, Mn .50-.70, Mo .90-1.10, V .20-.30

3. and the NEW LOW CARBON FLAT GROUND STEEL

Here's a fine-grained, forging quality, silicon-killed steel that offers important savings on jigs, fixtures, patterns, stripper plates, punch pads, die plates, die-blocking shims . . . and parts that don't require heat treatment, or in some cases just case-hardening. This new line of low-cost steel rounds out the Simonds line of Flat Ground Steel, has equally fine finish, with excellent welding quality and machinability. Furnished in a wide range of flats from 1/16" to 1 1/2" thick and 1/2" to 16" wide, and in squares from 3/8" to 2 1/8". All sizes come in standard, ready-to-use 24" lengths, individually packaged. *Typical Chemical Analysis:* C .18, Mn .50, Si .20, S .04, P .04

GET FULL DETAILS
PROMPT DELIVERY OF
ALL 3 TYPES
FROM YOUR SIMONDS DISTRIBUTOR

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

For Fast Service from Complete Stocks
Call your
SIMONDS Industrial Supply DISTRIBUTOR

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Van Keuren

METROLOGY LABORATORY

for the precise calibration and measurement of gages and precision parts.

New VK Metrology and Research Building, completed August, 1959

...THIS SEAL

is your guarantee of accuracy. Behind it stand 40 years of pioneering and experience in the field of precision measurement and manufacture.

THE Van Keuren CO.
Since 1920
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS
... rated the world's most accurate
Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts

impregnator as an English design.

As I am very much interested in getting in touch with the English manufacturer, I would appreciate your sending me his name and address.

Dipl Ing H v Hammerstein
Hanover, Germany

The Wickman impregnator is manufactured by Wickman Limited, Machine Tool Division, Banner Lane, Tile Hill, Coventry, England—Ed.

Aluminum muffler

Dear Sirs:

We noticed recently on your "Spot News" page that Centr-O-Cast & Engineering Co has developed a new cast aluminum muffler (*AM*—Nov 16 '59, p103).

We would greatly appreciate the full name and address of this firm in order to investigate this matter further.

A E Cella
New York, NY

The complete address is Centr-O-Cast & Engineering Co, 45 St Jean St, Detroit, Mich (L W Wickson, president)—Ed.

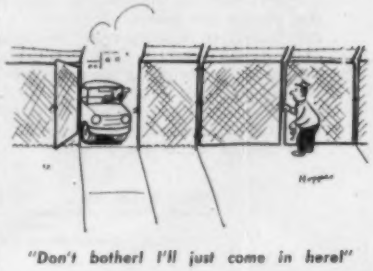
Feedback welder

Dear Sirs:

Please give us the address of The Budd Company whose feedback control for spotwelding is fully described in your issue of December 14 (*AM* — Dec 14 '59, p132)

R C Bauer
Kitchener, Ontario

For further information write to John P Poth, manager Electronic Controls Section, The Budd Company, 2450 Hunting Park Ave, Philadelphia 32, Penna—Ed.



"Don't bother! I'll just come in here!"

CALENDAR

American Institute of Mining, Metallurgical, & Petroleum Engineers—Annual Meeting, Feb 14-18, Statler Hilton and Sheraton Atlantic Hotels, New York, NY.

Society of Automotive Engineers—National Production meeting, Mar 22-24, Statler Hotel, Cleveland, Ohio.

Pressed Metal Institute—Spring Technical Meeting, Mar 23-25, Carter Hotel, Cleveland, Ohio.

National Screw Machine Products Association — Annual Meeting, Apr 3-6, Hotel Ambassador, Los Angeles, Calif.

National Metal Trades Association—New England Congress, Apr 5, Sheraton Plaza Hotel, Boston, Mass.

Society of Automotive Engineers—National Aeronautic Meeting, Apr 5-8, Hotel Commodore, New York, NY.

Annual Joint Conference on Automatic Techniques (ASME, IRE, AIEE)—Apr 18-20, Cleveland Sheraton Hotel, Cleveland, Ohio.

American Machine Tool Distributors Association — Semi-annual Meeting, Apr 18-20, Greenbrier Hotel, White Sulphur Springs, W Va.

Metal Treating Institute—Spring Meeting, Apr 20-22, British Colonial Hotel, Nassau.

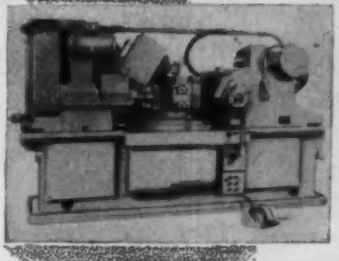
American Society of Tool Engineers—Tool Show, Apr 21-28, Detroit Artillery Armory, Detroit, Mich.

Metal Powder Industries Federation — Annual Meeting and Powder Metallurgy Show, Apr 25-27, Drake Hotel, Chicago, Ill.

American Welding Society—Annual Convention and Welding Show, Apr 25-29, Great Western Exhibit Center and Biltmore Hotel, Los Angeles, Calif.

Instrument Society of America—Instrument-Automation Conference and Exhibit, May 9-12, Civic Auditorium and Brooks Hall, San Francisco, Calif.

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore, it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

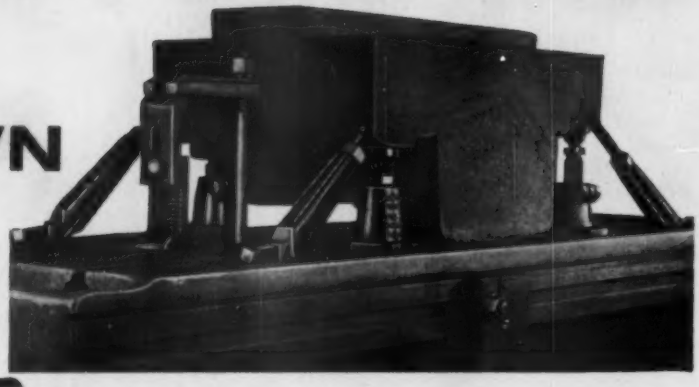
Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



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Whatever its shape, a work piece can be quickly, easily and safely set up on any T-slotted table with ARMSTRONG Set-up Tools. Comprising a complete "system" of supporting and holding devices in all essential sizes, ARMSTRONG Set-up Tools usually pay for themselves on the first job and continue to lower costs for years to come.

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Prevent Breakage and Spoilage—correctly designed, machined from special steels or drop forged and heat treated, they are extremely stiff, strong and reliable.

Increase Accuracy—hold work rigidly and support it fully regardless of shape.

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Increase Profits—by reducing down time, increasing man hour output, assuring accuracy, ARMSTRONG Set-up and Hold-down Tools cut costs and build profits. They are part of every properly equipped tool room and shop.

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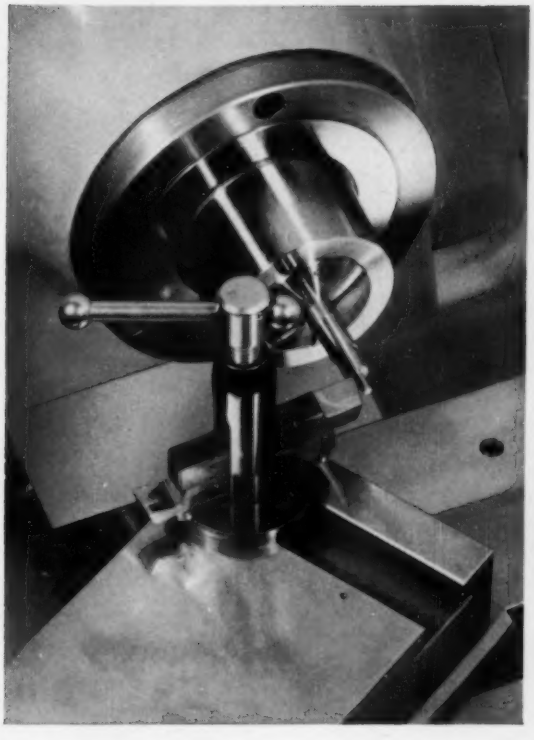

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CIRCLE 229 READER SERVICE CARD ►

Holds to watchmakers' tolerances, extends tool life 4 times

GULF MAKES THINGS

Fishing reel parts and small precision components for the aircraft industry don't seem to have much in common, except at Scripco Manufacturing Company, Inc., of Laingsbury, Michigan.

Scripco specializes in machining small pieces to exacting specifications. Take spinning reel drive gear stems, for example. When completed they're 1.341″ long. Scripco cuts them from B1113 steel in a single-spindle Brown & Sharpe at 230 sfm. Diameters (eight of them) must be held to tolerances of .0001″. Length must be held to .008″, thickness to .002″ and concentricity to within .002″. Made in 6 operations, pieces take 25 seconds to complete.

"To stay out of trouble on this job, we use Gulfcut 41C," says partner Frank Scripter. "It has just the right amount of sulfur to reduce cutting drag, without corroding the fine threads on this piece."

On another job—machining phosphor bronze pieces—Scripco quadrupled tool life by switching to Gulfcut. Previously they got only 1½ hours of tool life—now with Gulfcut they get a full 6 hours before regrinding.

Frank and James Scripter, brothers and owners of Scripco Manufacturing Company, Inc., Laingsbury, Michigan, show samples of small components to Herman Johnson, Gulf Sales Engineer.

Scripco uses Gulfcut 41C for machining type 416 stainless, B-1112 and B-1113 cold rolled steel. For tough and draggy type 303 stainless, Gulfcut 31C is used.

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RUN BETTER!

"With Gulfcut oils we can meet the exacting tolerance and finish specs required by the aircraft industry and our other customers. We can do it economically, too, because longer tool life means a smoother flow of production" says James Scripter.

See for yourself how Gulf makes things run better! Just call your nearest Gulf office. And use the coupon to get your free copy of the new 116-page manual "Metal Machining with Cutting Fluids." It contains complete information on cutting oil selection and usage.

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WHY BUY METAL YOU DON'T USE?

Switch to Allegheny Ludlum Cast-to-Shape Tools

FORGING

1250 lb. block, with 150 hours of machine time costing $1000, is necessary to fabricate die retainer.

CAST-TO-SHAPE

Cast-to-shape die retainer to hold automobile horn die weighs only 650 lbs., a $250 savings.

$1250 saved by changing to Cast-to-Shape tool steel

Paying for metal that ends up chips on the floor is a costly proposition these cost-conscious days. Here are two good reasons why you should switch your tool-making to Allegheny Ludlum cast-to-shape tools.

CAST-TO-SHAPE MEANS YOU BUY FEWER POUNDS OF METAL.

For example the manufacturer of automobile horns above saved 600 pounds of expensive alloy steel by specifying a cast-to-shape die retainer instead of fabricating it from a forged block. Result? A savings of $250, including the slight pattern cost.

CAST-TO-SHAPE MEANS LESS FINISH MACHINING.

To machine a retainer from the block above would have taken 150 hours of machine time at a cost of more than $1000. The Cast-to-Shape retainer is within ¼ to ⅜ inch of *finished* size, requiring only a *slight* roughing and finishing operation.

Allegheny Ludlum, a tool steel producer who makes cast-to-shape tools, casts them with the same precise quality control for which their tool steels is known. A full line of cast-to-shape tool steel grades is available. You'll find ones with high resistance to abrasion, compressive strengths of approximately 400,000 psi, easy machinability, hardening with almost no distortion, toughness, high red hardness, and the capacity to take a high polish.

Find out now how you can cut costs on your complex tools. Write for FC-4, a 28-page technical discussion of A-L's Forging and Casting Division with applications, pattern information, design tips, analyses, and heat treating instructions. Or call your nearest A-L tool steel warehouse or distributor.

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CIRCLE 231 READER SERVICE CARD

SPOT NEWS...

- **Bargaining leaders for the International Association of Machinists** have set a goal of 7% a year increase of wages and fringe benefits for 500,000 workers in the missiles, aircraft, and related electronic industries. Union is said to be seeking two-year contracts, estimates cost at about 17¢ an hour.

- **American Motors will build Ramblers** at its Toronto, Ontario, plant for the first time since 1957. Decision was prompted by a 43% gain in Rambler sales last year in Canada.

- **Machine tool leasing** will be a feature of the new general equipment leasing plan recently announced by the Hertz Corporation. Customer selects whatever equipment he needs from a supplier of his choice at a price agreed upon by him and the supplier. Hertz then buys the equipment, which is delivered directly to the customer. Hertz bills customer monthly, quarterly or annually in accordance with terms of the leasing agreement. Leasing is handled through Hertz Equipment Leasing Corp, newly formed subsidiary.

- **High-purity tungsten can now be easily plated on metal** surfaces by a vapor deposition process developed by the National Bureau of Standards. Process can be used to plate simple and complex parts such as missile nozzles and jet engine parts, also for the fabrication of tungsten articles. (See p110).

- **General Motors-Holden Ltd,** GM's Australian subsidiary, plans to build a $11.3 million car assembly plant. Work will start this year on the plant, which reportedly will be the most modern and most highly mechanized in the Southern Hemisphere, and one of the most modern in the world.

- **Foreign steel is dropping in price** by $1 to $2 a ton a week and may soon become competitive with domestic steel, which soon should feel the effect of post-strike hidden increases. Trend is likely to continue until late this month.

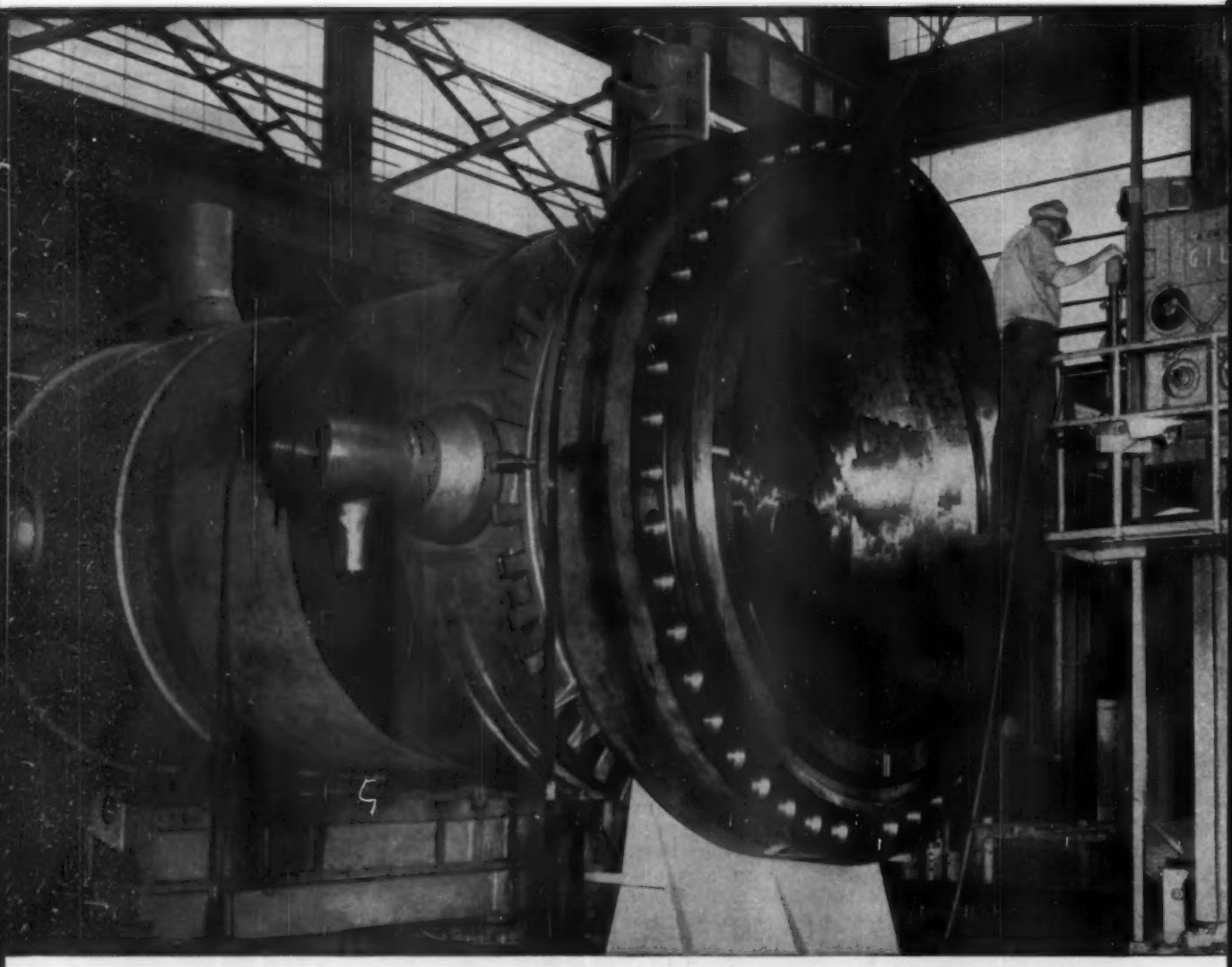
- **John Deere & Co will build a factory in France** to produce its tractors for the French farm machinery market. Factory, to be built and operated by a new subsidiary, Compagnie Francaise John Deere, is the fourth overseas manufacturing operation Deere has set up since entering the foreign field in 1955.

- **Chrysler's latest passenger-car gas turbine** is being readied for economy tests. Officials say they are aiming at a cost level in competition with the conventional V8, and are already very close. Ford's gas turbine, on the other hand, will go into the heavy truck market and compete with diesels.

- **The Pentagon frequently fails to reserve rights** to manufacturing drawings prepared under military contracts, with the result that the defense services often have to buy the drawings again for later production runs. This charge is made by the General Accounting Office in a new Congressional inquiry into military procurement practices.

- **Mexican government has reneged** on its first-six-months' import quotas of complete and knocked-down cars. The 40% cut has shocked industry spokesmen. Ford (Mexico) is laying off 700 workers next month; General Motors and others plan to do likewise.

- **Solid propellant rocket engines** with the largest total impulse and thrust now conceivable can be economically developed and manufactured by a method announced by the United Research Corp of Menlo Park, Calif, a subsidiary of United Aircraft. Patents have been filed and production facilities are being planned.



Courtesy Combustion Engineering, Inc.

Combustion Engineering specified more than "ordinary boring mills"

Combustion Engineering, Inc., pioneer manufacturer of heavy reactor vessels, concluded that ordinary boring mills would not produce the close tolerances and surface finish required in their critical operations. That is why they specified a Cincinnati Gilbert floor type boring mill for this job.

The workpiece is a 96-ton stainless steel reactor for a Naval nuclear power plant. The Gilbert machine is used to finish the boring of the bolt holes in the 20" thick flange, and to machine the outlet nozzles.

Combustion Engineering's high standards require a surface finish of 32 R.M.S. on some of the bolt holes—an easy specification for a Gilbert, which can bore holes with a mirror finish, when required. A Tele-Vernier optical measuring system increases the speed and accuracy of machine positioning.

Work of equally high quality is produced on a number of other Gilbert boring mills at Combustion Engineering's Chattanooga and Windsor plants—proof that "those who buy Gilbert buy Gilbert again."

Write for new Bulletin 558.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.

GILBERT

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CIRCLE 333 READER SERVICE CARD

WASHINGTON...

Rumpus over "missile gap"...

The new rumpus over the so-called missile gap is complicated by two factors.

First, Eisenhower strategists have switched the emphasis in compiling intelligence estimates. Their latest estimate on Soviet missile power is based primarily on what they consider Moscow's "intentions" on ICBM deployment rather than a consideration of Soviet "capabilities" to produce the missiles. The administration's explanation: Russia's ICBM program has advanced far enough now from early development to allow our intelligence people a sharper interpretation of Soviet planning.

Up to now, the broader concept of "capabilities" has been stressed. The upshot has been a general acceptance that the Soviet Union would have an arsenal of operational ICBMs at least three times the size of ours during 1961-64.

Besides this change in approach in interpreting intelligence estimates, the administration believes it has more sophisticated raw intelligence data on which to make final intelligence conclusions. In part, this is based on improved electronic tapping of Russian communications.

It all adds up to an administration conviction that Russian missile strength has been exaggerated. About two years ago, for instance, the Rand Corp, the Air Force's brain-trusting contractors, predicted Russia would have 300 operational ICBMs by 1960, starting up much of the subsequent fuss over a missile gap.

Now, official Washington does not think the Russians will have anywhere near as many missiles by this year. The administration concedes only a "moderate numerical superiority" for the Russians in the near future. Administration leaders even minimize this advantage, argue that a maximum Soviet nuclear blow could not destroy our ability to devastate Russia in retaliation.

The critical reaction...

The administration's latest stand has infuriated authoritative critics of defense policy here. They see it as dangerous complacency.

But the controversy is also colored by politics. The Democrats are starved for election issues and are leaping on the defense question. Their fundamental claim: In eight years of Republican administration the US has fallen from primacy in world military power to a position of second place behind the Soviet Union.

The outcome might be a new Congressional drive to increase ICBM and Polaris production schedules above present rates.

Plan to promote overseas trade...

Plans are under way in the State and Commerce Departments to beef up US trade overseas by tripling the number of commercial officers abroad.

Right now, there are some 113 commercial officers assigned to diplomatic posts around the world. If Commerce has its way, the number will increase to over 300. The proposal is to draw the new officers from the ranks of industry, rather than from within the government. Salaries to entice businessmen to take the posts would be around $15,000 plus allowances, depending on business experience. Assignments would be for at least four years in each post.

There are still many details to be ironed out, but the goal is to have all the issues settled by early March—with posts being filled by late in the year. Prime job of the commercial officers would be to promote US trade and feed back news of foreign industrial developments.

Anti-merger...

As the government's recent moves to block another steel company merger show, the Justice Department is stepping up its anti-merger program.

As part of this, the proposed merger between Boeing Airplane Co and Vertol Aircraft Corp may hit a government snag. Justice Department antitrusters have been quietly investigating the pros and cons of this merger, to determine if a suit should be filed to block the deal.

Under the Clayton Antitrust Act, the Justice Department has powerful weapons to block or break apart mergers which may threaten competition or tend to create monopoly. It is this possibility in the Boeing-Vertol merger that the antitrusters are checking.

How to expand...

the US economy to meet the Soviet threat is becoming a hot political issue. The Democrats and Republicans split sharply over how to maximize US growth, in a recent report summing up the results of weeks of hearings last fall on inflation, unemployment and growth.

Inflation and unemployment have dwindled as political issues, and the Democrats are trying to pump up "growth"—which to them means more spending on military, space, housing, and the like.

Both Republicans and Democrats on the Joint Economic Committee say they want lower tariffs, more vigorous anti-trust action, and some tax reform.

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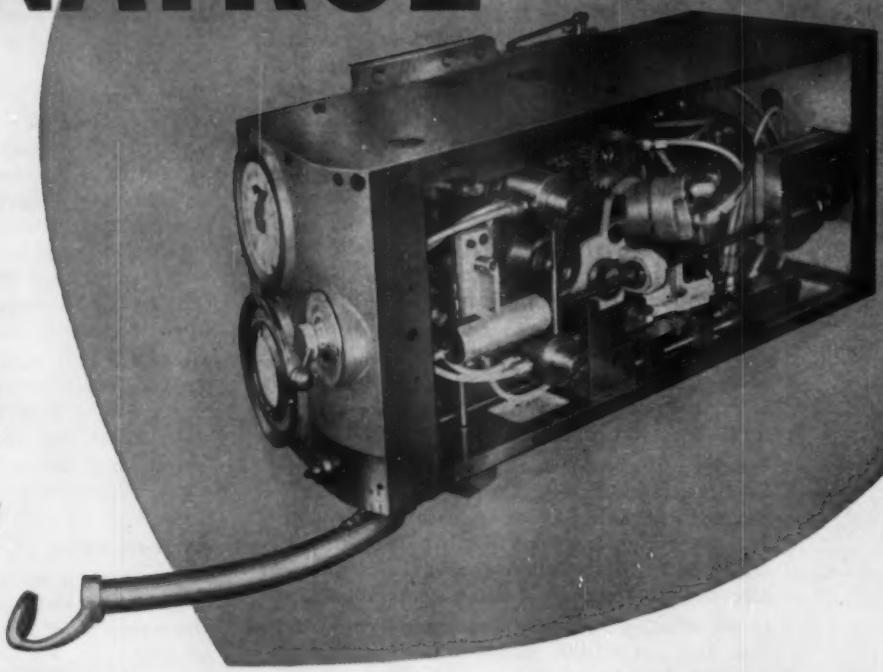

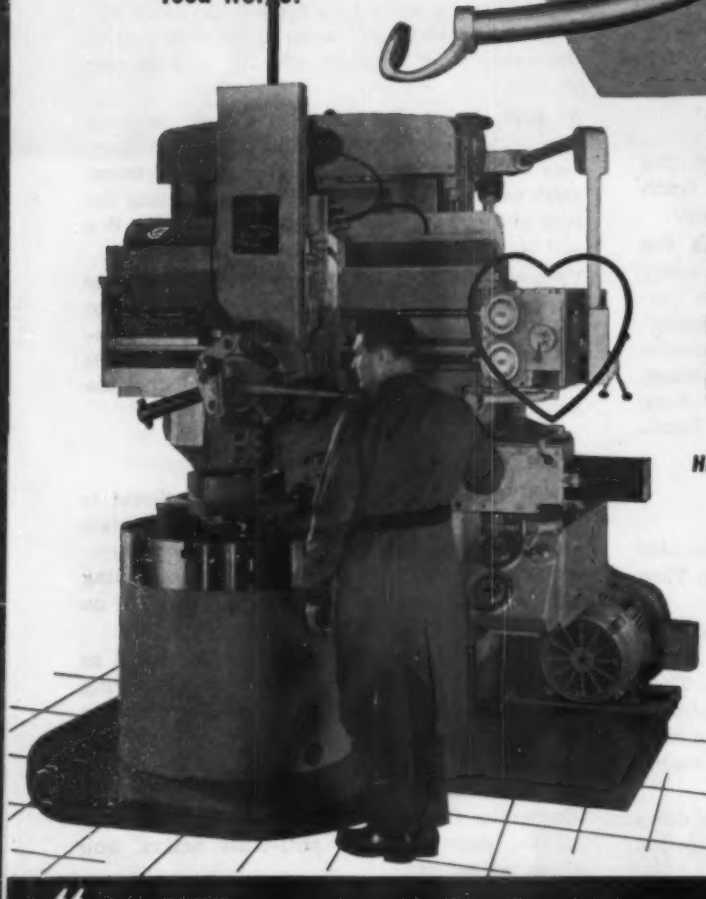

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Unique Size-Au-Trol* for accurate positioning of all heads. Contouring attachments: Hydraulic, electronic or electro-hydraulic. Four of five-sided power-indexing turret heads. Thread cutting, drum scoring and angle turning attachment. Power-operated chucks.

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DETROIT...

Records set . . .

Chevrolet during the second week of January turned out 60,856 passenger cars and trucks for an all-time industry record. Then, apparently still not satisfied, the division followed up the next week by producing 62, 529 vehicles. Breakdown of this last total includes 41,644 conventional cars, 9,250 Corvairs and 11,635 trucks.

Meanwhile Ford, though unable to set industry records due to lack of production facilities, managed to topple its own high production figure set 35 years ago. Ford car and truck production during the week ending January 23 totaled 52,574 units. Falcons are accounting for one out of every three passenger cars produced.

Dodge sales, paced by the new Dart on a 4 to 1 basis, are running 82% higher than a year ago for a total of 71,207 units since the 1960 models were introduced on October 9. This division also builds Valiants for Plymouth in its Hamtramck plant at the rate of about 4600 a week. By spring Chrysler assembly plants in St Louis and Newark (Del) will each add 1500 Valiants a week to the total in an effort to relieve widespread dealer complaints of insufficient stock. Dodge's own compact car, basically a Valiant but somewhat larger, is now expected by early fall.

Rambler too seems to be moving nowhere but up lately. Sales for the second 10-day period of January were paced 68% ahead of record-breaking 1959. The small American accounts for about 27% of this total, a figure that makes AMC accountants smile because little if any tooling must be amortized. Expansion at the company's Kenosha and Milwaukee plants will provide for a 700,000-unit annual capacity by the beginning of the 1961 model year.

Other makers are also gaining but in a less spectacular manner. Buick, Pontiac and Chrysler are showing substantial increases over last year, while Imperial, Thunderbird and DeSoto are running ahead by smaller margins. Cadillac, Studebaker, Plymouth, Oldsmobile and Lincoln are running slightly behind, but this can be partially attributed to shortages resulting from the steel strike.

The Compact niche . . .

Are Corvair, Falcon and Valiant prematurely basking in the flush of early success, or is their future assured? This question is currently going the rounds within and without mahogany-paneled Detroit offices, and most observers agree that it is a little early to answer definitively.

On the plus side, sales are certainly strong. Dealers' cash registers are ringing up one Falcon for every three standard-size Fords. The Chevrolet Corvair ratio is currently running about four to one and, as we have said, Plymouth dealers are handicapped by a shortage of Valiants even though only 40% of dealers handle both lines. According to Ward's Reports US-made compacts are taking a healthy 63% of the 108-in.-wheelbase-and-below market and this figure, of course, does not include Mercury's attractive Comet which bowed in on February 2.

Further plusses are indicated by the swift moves on the part of the big three and the independents to augment the range of body styles available. Corvair wasted little time in bringing a two-door coupe to market, and it was closely followed by Falcon station wagon. Valiant was early with its wagon and the Comet is wisely offering both these and sedans from the onset.

Complaints of not enough performance, which historically, if paradoxically, plague economy-car builders, have been met by public offering of factory-installed "Hot-Rod" kits by every maker so far except Falcon and Comet. The Valiant kit, in fact, boosts horsepower to 145, a figure that insures snappy get-away and passing. And just the other day Rambler announced availability of its big OHV-six in the baby American, giving what it claims to be "performance unequalled in the compact car field."

Gas Mileage disappointing . . .

All surveys, both internal and external, show definite public disappointment in gas mileage, particularly with the Corvair. Chevrolet officials attribute this to early problems with carburetor icing which have since been corrected, but admit that the reputation thus gained has been damaging. The Falcon remains surprisingly free of bugs, and Valiant complaints center around occasional instances of poor workmanship, particularly installation of sealing and trim.

. . . an example of Automatic Production by Greenlee . . .

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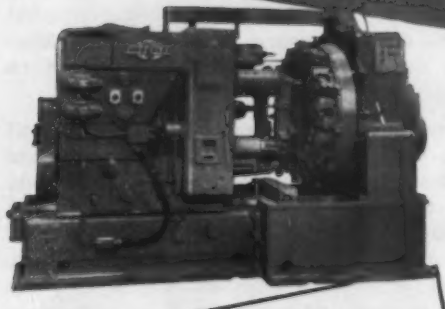

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STATION 9 — semi-finish bore
STATION 10 — finish ream, finish bore
STATION 11 — finish ream
STATION 12 — finish ream, finish bore

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AIRCRAFT and MISSILES..

New R&D orders to fall off . . .

The administration's hold-down on defense spending will have a sharp impact on new contracts for research and development next year. Total orders will drop from $4.3 billion this year to $3.9 billion.

Actual figures on funds to be earmarked for specific projects are still classified, but here are the percentage changes planned for major aircraft, missile, and astronautic R&D projects.

Rundown on projects . . .

Obligation of new funds for the Army's Nike Zeus anti-ICBM system will be cut 31%. Actual outlay of money for the project, however, reflecting contractual commitments made in the past, will stay at the $300-million level. The Army unsuccessfully sought an additional $700 million to begin production next year. Major contractors are Western Electric, Douglas Aircraft, Lear, Remington Rand, Sperry Gyroscrope, RCA, Goodyear Aircraft, and Ryan Aeronautical.

In terms of new funds, the Air Force's B-70 bomber (North American Aviation) will be slashed 50% from this year; the Navy's Transit navigation satellite (Johns Hopkins' Applied Physics Lab), 58%; and the Navy's Asroc anti-submarine missile (Minneapolis-Honeywell), 34%.

Some projects to be increased . . .

New contracting on other R&D projects, now at a relatively low level of effort, will be stepped up. The Navy's Eagle long-range air-to-air missile (Bendix and Grumman are the major contractors) will be increased 48% over this year's rate of obligations.

The Air Force's Midas infra-red early warning satellite program (Lockheed) will be boosted 70% in terms of new funds; Air Force's Dyna-Soar experimental boost-glide orbital space vehicle (Boeing, Martin) will be increased 66%; Army's Pershing tactical missile (Martin), 42%; Air Force's Samos reconnaissance satellite (Lockheed), 33%; Army's Sergeant tactical missile (Sperry), 30%; Air Force's Minuteman ICBM (Boeing, North American Aviation, Thiokol, Aerojet-General), 19%; and the Army's Notus communications satellite (Philco, GE, Bendix, ITT), 8%.

Bidding for Navy plane . . .

Boeing Airplane will submit engineering design and cost proposals for design and production of the Navy's proposed new Missileer aircraft. The plane, reportedly subsonic, will be designed to carry the long-range Eagle air-to-air missile. At least six other aircraft builders are competing for the contract. The Navy plans to select contractor later this spring.

Another Air Force cancellation . . .

Latest target in the Pentagon's drive to weed out so-called marginal projects is Sperry Gyroscope's ALQ-27 electronic countermeasures system. The Air Force has cancelled the project on which $182.6 million was spent, expects to recover another $127.2 million from its contract.

Minuteman moves ahead . . .

The Air Force has picked Aerojet-General to produce the second-stage propulsion system of the solid-fueled Minuteman ICBM. Thiokol, which is building the larger first-stage booster, competed with Aerojet for the second-stage engine.

Aerojet's production contract is "subject to successful tests of their hardware," the Air Force says. Thiokol, therefore, will be authorized to continue R&D work on the Minuteman second-stage engine as a "backup" project. Aerojet and Hercules Powder Co, meantime, are still competing for a production contract on the third-stage engine.

Pentagon's new shopping list . . .

The $6-billion aircraft procurement schedule of the Air Force for fiscal 1961, starting next July 1, earmarks $500 million for Convair's B-58 medium supersonic bombers. Pentagon insiders say this is only $64 million under the sum originally requested. Funds will presumably cover production of remaining planes to equip three combat wings of 36 aircraft each. In all, this will bring the Air Force's investment in B-58s to $3 billion. This is in the wake of a continuing drive — obviously unsuccessful — within the Pentagon to substantially reduce or even kill the program.

Also on the Air Force's shopping list: about 45 more Boeing B-52H bombers (with turbofan engines and designed to carry Hound Dog missiles) and more KC-135 jet tanker aircraft.

The new budget earmarks $170 million for procurement of North American Aviation Hound Dog air-to-surface missiles, $421.5 million for Boeing Bomarc B anti-aircraft missiles, and $111.4 million for the Army's Nike Hercules anti-aircraft missile.

The Hercules will be phased out of production after this year. Output of Bomarc B—equipped with a solid-fueled rocket booster—will continue through 1963, under present plans, despite recent unsuccessful flight tests with the missile.

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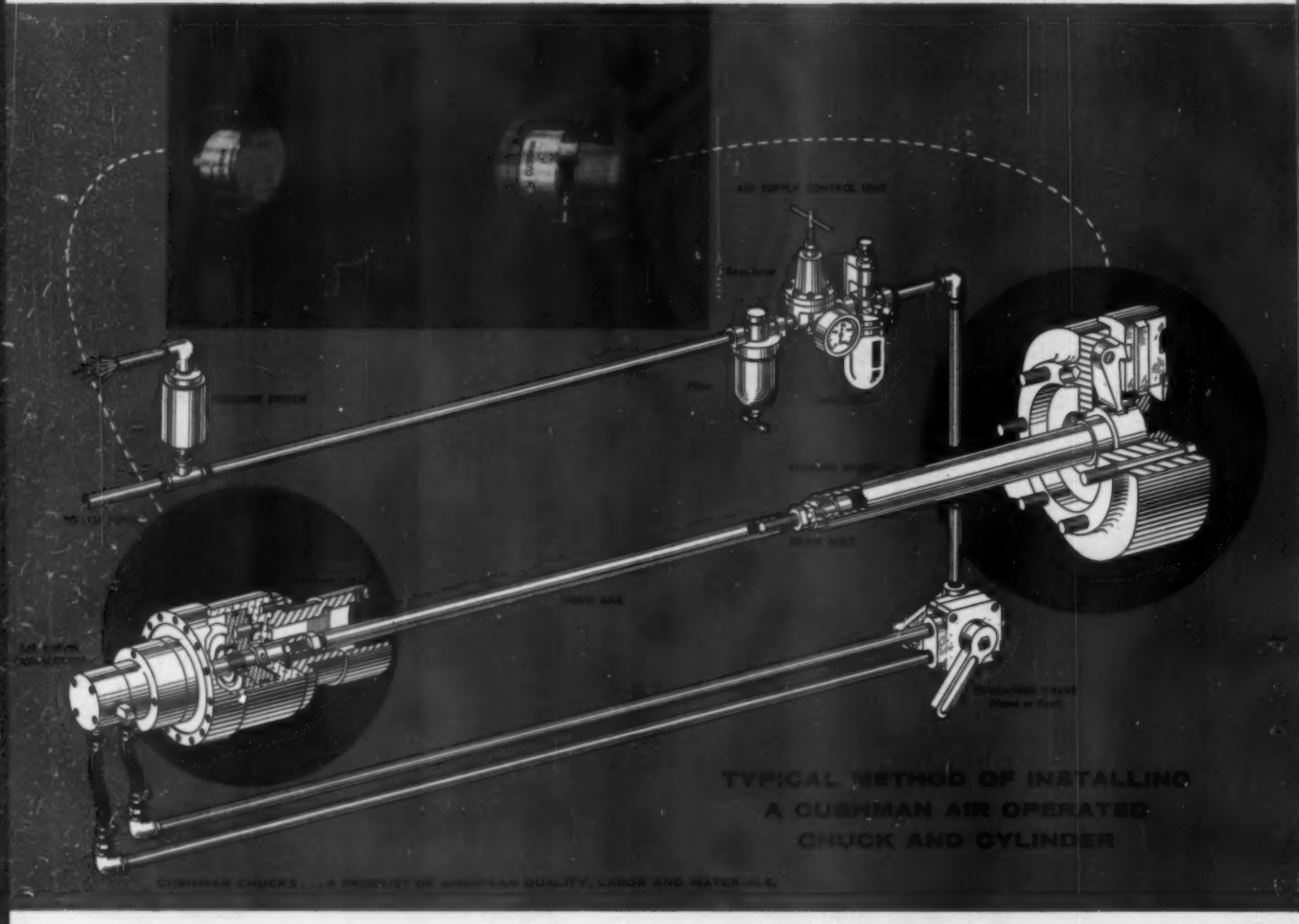

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MACHINE TOOLS...

Users prepare for March meeting...

To try to work out standardization of certain tooling areas of general-purpose machine tools, four subcommittees sponsored by a group of important machine tool users are preparing for a March 15 meeting in Detroit.

D J Reale of International Business Machines is chairman of the subcommittee on wheel mounts for surface grinders with horizontal spindles.

Other subcommittee chairmen: A A Herzberg of Waukesha Motors, for drilling machines; C E Moore of Mack Truck, for lathes; and A H Braadh of Deere Tractor Works, for milling machines.

These subcommittee chairmen, plus an advisory group consisting of representatives from General Motors, Ford, Chrysler and IBM, will attend the March 15 meeting. Machine tool builders who make types of machines affected also are to be invited.

More than two dozen user companies are behind the push for standardization. In addition to the firms already mentioned, sponsors include Bell & Howell, International Harvester, North American Aviation, Western Electric, Thompson-Ramo-Wooldrdige, American Motors, Caterpillar Tractor and Bendix.

About 56 persons were present at the first meeting in Detroit last June. Since then sessions have been held in Chicago and New York. Robert Witsche of International Harvester is general chairman of the sponsoring group.

Navy creates machine tool agency...

The Navy has established a new agency, called the Navy Production Equipment Control Office (Navpeco), to centralize management control over production equipment matters. Headquarters is at the former gun factory in Washington, now the Navy's weapons plant. The agency is similar in organization and responsibilities to the Air Force's Directorate of Machine Tools at the Warner-Robins Air Materiel Command, Macon, Ga, and to the Army's Production Equipment Agency at Rock Island, Ill.

Navpeco's job will be to 1) compile current and long-range production equipment needs; 2) handle tool acquisition and disposal actions; 3) direct maintenance and replacement of production equipment; 4) administer the allocation of reserve tools; 5) supervise the preservation and storage of idle machines; and 6) to control tool leasing.

Commander L L Brannan, a 10-year Navy veteran in production management, is acting officer-in-charge at the new agency. Within a year or so the agency is expected to have a staff of 120.

Up to now each Navy bureau has been responsible for its own machine tool program and has controlled its machine tool reserves.

To be machine tool focal point...

The new agency will not buy machine tools. Each bureau will continue to generate requirements and to provide funds for purchase of production equipment for current use. But Navpeco will review all procurement plans. Its objective is to make sure that equipment already in the inventory of the Navy's various bureaus is redistributed for current production. Eventually the new agency may handle procurement to modernize tool reserves.

Officials of the new agency will be the focal point in the Navy for machine tool builders and users on all production equipment matters.

Melman Report to be studied...

The British government has appointed a committee of machine tool builders and users to study the recent report of Professor Seymour Melman of Columbia University which criticized the western European machine tool industry as inefficient compared with the Soviet Union.

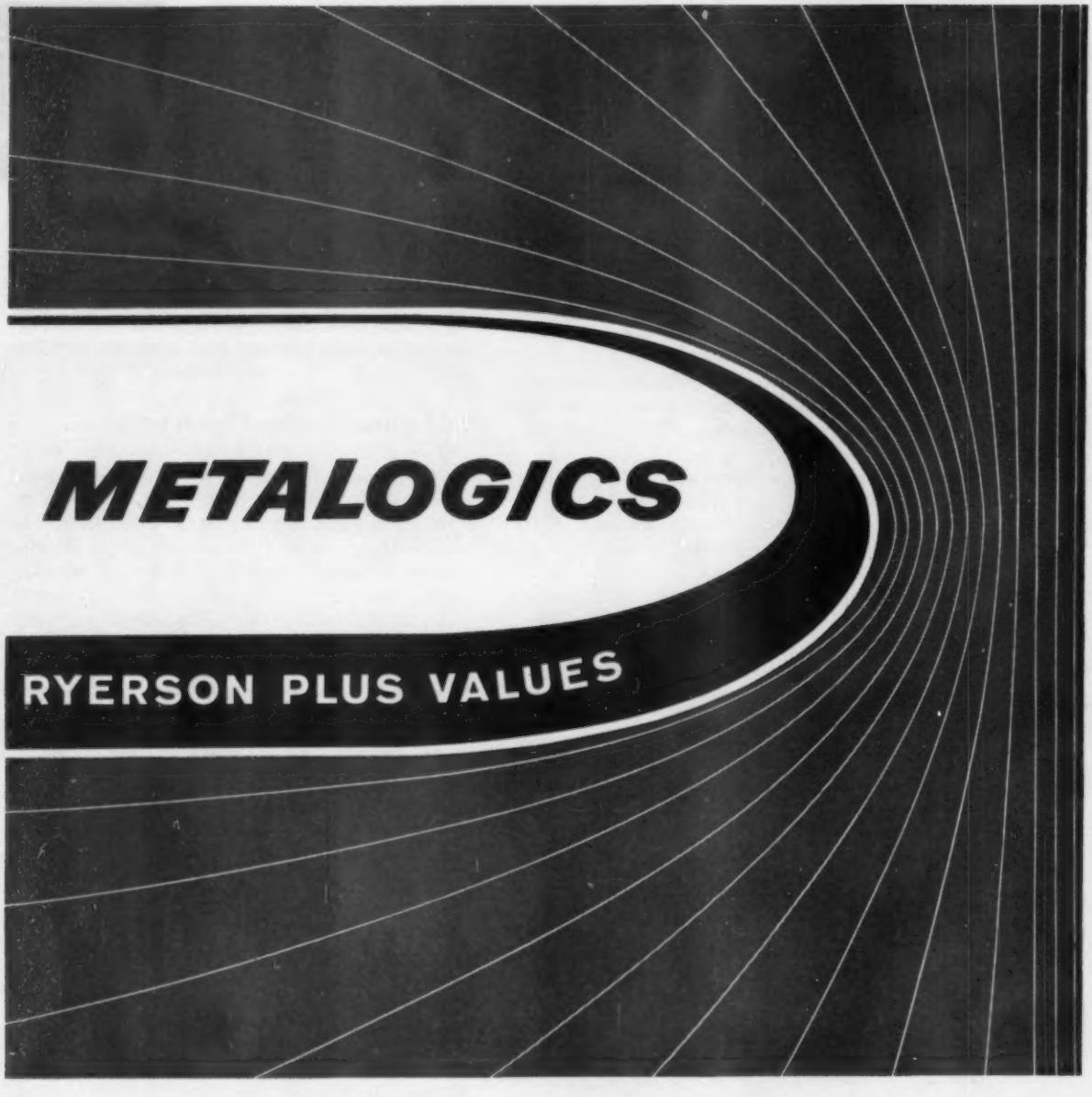
The committee is expected to complete its study in four or five months and report to the Machine Tool Advisory Council what action could usefully be taken by the British industry on Professor Melman's recommendations.

Sir Steuart Mitchell, controller of guided weapons and electronics in the British Ministry of Aviation, is committee chairman.

Professor Melman's report was made to the European Productivity Agency, an affiliate of the Organization of European Economic Cooperation in Paris.

K&T reports...

Kearney & Trecker Corp received orders for 58 numerically-controlled Milwaukee-Matic machines during 1959. Of that number, 30 were delivered before the end of the year, leaving a backlog of 28 machines. Production schedule calls for building more than two machines a week in 1960. K&T expects to add to its backlog as the year goes on.



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MATERIALS...

Steel distributors outlook . . .

"By April of this year service center (distributors) inventories of industrial steel products will be back to desired levels for service to metal consumers, with the exception of sheet mill products," reports Robert G Welch, executive vp, Steel Service Center Institute, Cleveland. "From a low point of 825,000 tons of industrial steel products in service center stocks, reached in early December, our industry expects to be able to build inventories back to 3,000,000 tons during the second quarter. Because of high demand for sheets, total inventories are not expected to reach the 3,400,000 ton level, which is considered adequate to serve every customer's needs, until August."

In predicting shipments from service center stocks of industrial steel products during the current year, committee members emphasized the crucial role played by raw-material inventories in determining the general level of industrial activity. Based upon current business activity, individual company executives estimated that first half, 1960 shipments shall be above the first half of 1959 by perhaps 10 per cent, although there will be large variations by individual products and geographic regions.

Service center shipments of flat-rolled steel in the Middle West are reported as particularly strong, reflecting current high levels of activity in the automotive and appliance fields. With the end to the uncertainty concerning the final steel settlement, new construction contracts have been awarded which will also contribute to good business during the first half, they said. Cutbacks in missile and aircraft programs were cited as depressing factors to general business conditions on the West Coast.

"The buildup of service center inventories of industrial-steel products will be just like running a movie backwards," Welch said. "Those products that were in short supply early in the strike will be the last to come into balance. Previous predictions that our industry would require from six to eight months to rebuild strike-depleted stocks appear to be quite accurate," he said.

"In the two months since the mills reopened, our stocks of tool steel and stainless steel have been virtually replaced. Inventories of cold-finished bars, structurals, hot rolled bars, and plates are improving daily, and slow but steady improvement is being noted in such products as wide-flange beams, alloy bars, hot and cold-rolled sheets, and galvanized sheets. Most products should be in reasonable supply by April, although it will take another two months to fill out item shortages in alloy and cold-finished bars and tonnage shortages in cold-rolled sheets and galvanized sheets.

"For the entire year 1960, present indications are that our total shipments of industrial steel products will be approximately 8.5 million tons, as compared to 9.3 million in 1959. In addition, we will purchase an additional 2.5 million tons for inventory replacement, with all but 300,000 or 400,000 tons of this being received in the first half."

"Once steel inventory building starts, it invariably has continued past sound levels," Welch said. "Then, after it is too late, buying stops until these stocks are liquidated and a recession develops. With sound planning, this time we are hopeful a similar situation can be avoided and inventory levels can be maintained in close relation to current production."

"With the steel industry able to produce far more steel than will be required in the immediate future, and with the increasing services available from steel service centers, there is no longer any necessity for manufacturers to go through an inventory feast or famine cycle."

One pound of scandium . . .

Scandium, an extremely rare metal, is believed to have some unique properties. It has a density comparable to aluminum but the relatively high melting point of 2822 F, or about two and one half times the melting temperature of aluminum. For the first time, a quantity of scandium as "large" as one pound has been produced by Union Carbide Metals Co, division of Union Carbide Corp. It is in the form of two disks 3-1/8 in. dia by 3/4 in. thick and 99% pure.

Marking accomplishment of the first of two contracts with Materials Laboratory, ARDC, and the Air Materiel Command, USAF, this quantity fulfills the requirement. The second contract, already underway, calls for analysis of the material by Union Carbide Metals to study its physical, chemical and mechanical properties.

WI-52 replaces X-40 alloy . . .

Performing successfully at temperatures up to 1750 F in jet engines, a new alloy WI-52 is being used for turbine nozzle vanes in the Pratt & Whitney J-57 engine that powers the 707 and DC-8. Developed under a research contract for the Tungsten Institute, the alloy contains 13% tungsten and supplants the X-40 alloy which has been used since 1941 and has an operating peak of 1600 F. Protective coatings of chromium and aluminum have been developed to offset the oxidation which occurs at 1750 F.

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STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

WHAT'S AHEAD... in Metalworking

TRENDS

Few obstacles on road to new production peaks . . .

With steel supplies getting back to normal there are few obstacles to prevent the metalworking industry in 1960 from consolidating and building upon production gains already made.

Steel deliveries, with the exception of cold- and hot-rolled sheet, which is still in fairly tight supply, are being spread around the metalworking industry, with no segment, not even the automobile industry, getting a lion's share while others wait. Anyone whose order was placed at the end of the third quarter or early in the fourth quarter is getting prompt and complete deliveries.

One of the big gainers last year was the industrial heating equipment industry, and the outlook for 1960 is just as good. Orders placed with members of the Industrial Heating Equipment Association in 1959 ran to about $123 million, compared to $51 million in 1958.

Forging industry executives anticipate substantial business gains, some as high as 25%. Several midwestern forge shops report the largest backlog of orders in many years, with new orders up 30-35%. Commercial forge plants heavily geared to the production of automotive parts expect to follow the auto industry's predicted upswing of over 20%.

Manufacturers of airplane parts see a year of steady sales and shipments. Though little or no increase over last year's volume is expected, the important aspect is that few companies foresee a marked decline in volume. One manufacturer, however, points out that there is no Air Force program that extends beyond 1961, and that "the roof might fall in" at that time.

Nothing seems to be booming as much as the leisure market. Outboard motor sales should be up 10% above 1959's 540,000 units, and by 1970 should hit 1,200,000.

Latest figures from the tool and die industry continue to show marked sales increases over a year ago—33% for the latest month. Employment was up 2% for the same period. NTDMA reports its members are feeling the beneficial effects of an auto tooling program in Detroit, business from which is coming in better now than it has for the past few years. West Coast tool and die shops, however, are feeling the effect of aircraft program cutbacks.

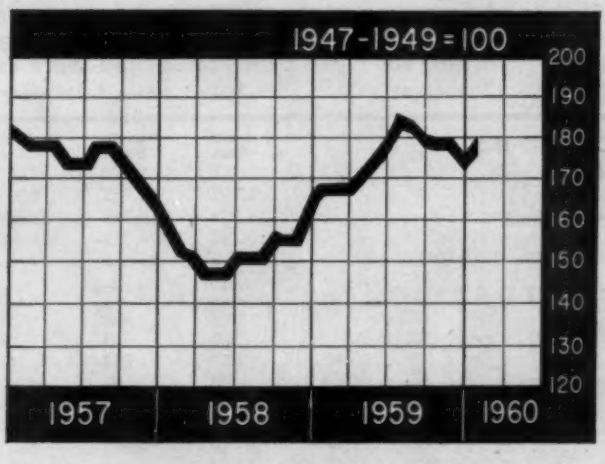
Producers of screw machine products for the electronics industry are optimistic—and they should be. Production is at peak rates, with a generally bullish outlook for the first six months of 1960. Employment is at peak levels, even going into overtime work.

Metalworking job shops are getting more business now that steel is coming through, and the prospects for the year generally are good. Business now is a little behind what it was a year ago (estimates range from equal to down 10%), but it should be up 10 to 15% for the year.

Plastic molding shops have been busy so far. Last year was a good one, and this is expected to be 10 to 20% better in sales. Optimism is based on new materials and new applications. Most firms have substantial backlogs.

Plumbing supply manufacturers see a good year, possibly tapering off slightly in the fourth quarter. Backlogs, in general, are substantially higher than a year ago.

The 1960 optimism of the heat treating job shops hasn't panned out. The outlook now is that business will be only fair.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

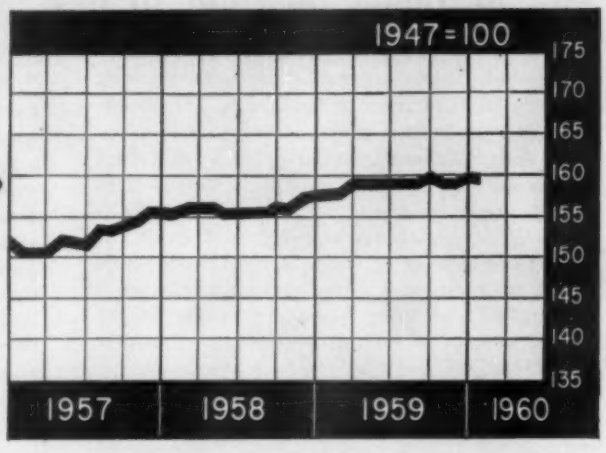
	JAN. Estimated	DEC. Preliminary	NOV. Revised	DEC. Year Ago
Total Index	**180**	**175**	**171**	**165**
Machinery	155	154	132	
Electrical Machinery	221	218	190	
Autos	125	91	141	
Other Transportation	330	330	314	
Other Metalworking	148	148	143	

TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JAN. Estimated	DEC. Preliminary	NOV. Revised	DEC. Year Ago
Total Index	**159.6**	**159.6**	**159.6**	**157.9**
Metalworking Machinery	**190.0**	**188.9**		**182.2**
Other Machinery exec. Electrical	**172.0**	**171.9**		**168.8**
Electrical Machinery	**162.2**	**162.4**		**158.6**
Fabricated Metal Products	**148.3**	**148.3**		**148.4**



Perspective on the steel settlement . . .

Though the steel settlement ended worries about future supplies of steel, it raised new questions about costs and prices in the months ahead. Here is a brief rundown of some of the key points of the agreement that will help put such questions into proper perspective.

There is new cost push pressure being exerted on steel prices as a result of the agreement. Total labor costs will go up about 3½% a year for the 1959-62 period. That's more of an increase than can be offset by productivity gains of the kind we've gotten in recent years. Strictly speaking, therefore, the agreement is inflationary.

But the new contract is a far better deal than the companies were able to negotiate at the bargaining table in 1956. Immediate cost to the companies is under 11¢ an hour. Over the three-year period, costs will be less than 41¢ an hour, compared with the 62¢ cost of the old agreement.

One important reason is that cost of living adjustments, which the companies may have to add to hourly wages, are limited to 6¢ (3¢ a year in the final two years of the contract). This wage escalation came to 17¢ under the previous agreement. Now the wage-price spiral is under better control.

Still, it's unlikely that steel companies can absorb all their added costs without asking higher prices. True, the new costs look small in terms of percentages. But in total dollars they would take a substantial bite out of steel profits.

Just when price increases will come is questionable. Initially the new contract adds only 11¢ an hour to labor costs. But come December, further increases will bring the total hourly cost of the agreement to 25¢. By that time, too, operating rates in steel may be well below current peaks. Companies will then really begin to feel the pinch of added costs. It seems likely that some price increases will occur at that time.

In sum, the steel companies didn't win the battle they set out to fight. The cost push hasn't been halted, but it has been slowed. And that's an important gain in the battle against inflation.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	160.1	160.2	144.3
Steel ingot production (thousand tons)	2,717	2,727	2,178
Electric power output (million Kilowatt hours)	14,523	14,236	13,394
Production of automobiles and trucks	176,265	173,713	126,843
Engineering construction awards (Eng. News-Record, millions)	$245.2	$372.9	$418.2

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	266	330	246
Vacuum cleaners sales (thousands of units)	290	331	294
Washers sales (thousands of units)	313	374	333
Household electric ranges sales (thousands of units)	73	74	74
Radio production (thousands of units)	1,346	1,796	1,546
Television production (thousands of units)	561	707	438
Gear sales index (1947-49=100)	233.9	208.7	182.7
Foundry equipment new orders index (shipments, 1947-49=100)	131.2	140.8	83.3

*Seasonally adjusted

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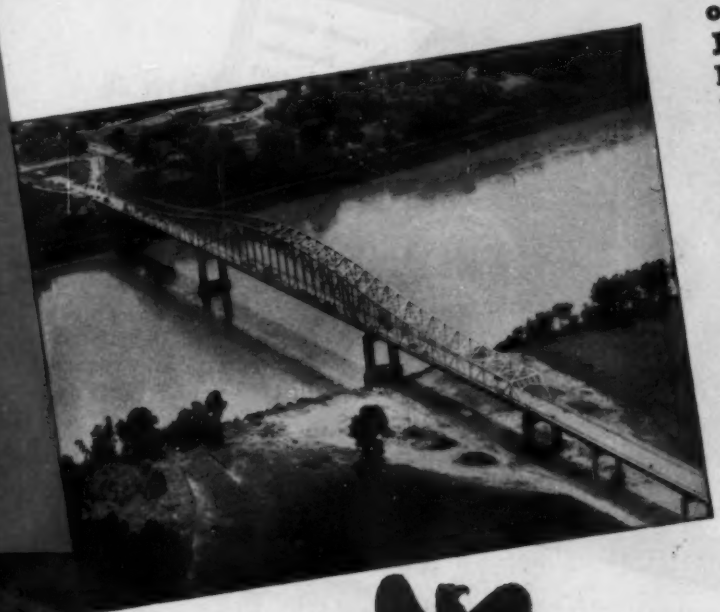
required in the construction of the recently completed Jefferson City, Missouri bridge by Stupp Bros. Bridge and Iron Company, of St. Louis, Missouri, were all drilled by "AMERICAN" Hole Wizard Radials.



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This Exciting New World of Metalworking

A friend of mine recently had quite a day. He attended an early morning meeting in Geneva, Switzerland, flew to London for a late luncheon, and then on to Idlewild in time to sleep that night in his home on Long Island.

Such an experience...

may be commonplace before long. The prediction is that not many years off a rocket-type plane will carry passengers from Europe to America in two hours. Impossible? Don't be too sure.

Speed of travel is not the only barrier being broken these days. Technological changes, though hardly having the dramatic impact of jet planes and space ships, are breaking through in just as spectacular a way.

Take the metalworking industry. New and strange names have come to the front to describe revolutionary manufacturing processes—such names as electron-beam machining, and electro-chemical milling, and liquid-jet machining and hot machining. You may not know what some of them are, but you soon will. They are radical departures from the long-accepted methods of cutting chips.

Progress is, if anything...

even more daring and precedent-shattering in the forming and shaping of metal than in machining it. Have you seen at first hand the process of shear forming, and of internal swaging, and of hot forming, and of explosive forming? Energy is delivered so rapidly, when explosive force is used, that it is completely contained within the metal and moves the metal through the die so quickly that the die does not know that it has been hit.

Amazing innovations are not confined to the exotic processes just described. They spill over into metal-cutting and metal-forming machines as we have known them. Envision the drastic changes the next five years resulting from wide application of numerical control, the growing use of the so-called all-purpose, completely-automated machine tool, the quick die-change press. What a far cry from the traditional machine shop and stamping plant!

Get away from machining and forming, and into other production operations, and the same kind of pioneering is being done. Plasma-arc welding, feedback control of welding, electric-blanket heating, and ultra-fast heating furnaces immediately come to mind. Metal finishing methods are being completely transformed by revolutionary new paints.

Revolutionary developments...

extend beyond production processes and metals to manufacturing management and production workers. The old-time method of running a plant on the basis of long experience and nothing else is out-of-date, and of selecting and contorlling production machines and techniques in hit-or-miss fashion. Times change, and in the present age of precision and fierce competition, manufacturing engineering is coming into its own. Today the production planners have taken their place in importance alongside top manufacturing administrators and direct shop management.

As to the shop worker, his daily routine bears slight resemblance to that of his compatriot of a generation ago. Brawn and muscle no longer count. Mechanical devices do the lifting and hauling and setting in place. Button pushing is the most strenuous physical work that he is called upon to do.

So the metalworking world of today is not like the world of yesterday's machinist, no matter from what angle you view it. No wonder that in this exciting new world of fast changes, we on AMERICAN MACHINIST have decided that from now on we will be known as AMERICAN MACHINIST/METALWORKING MANUFACTURING.

Burnham Finney EDITOR

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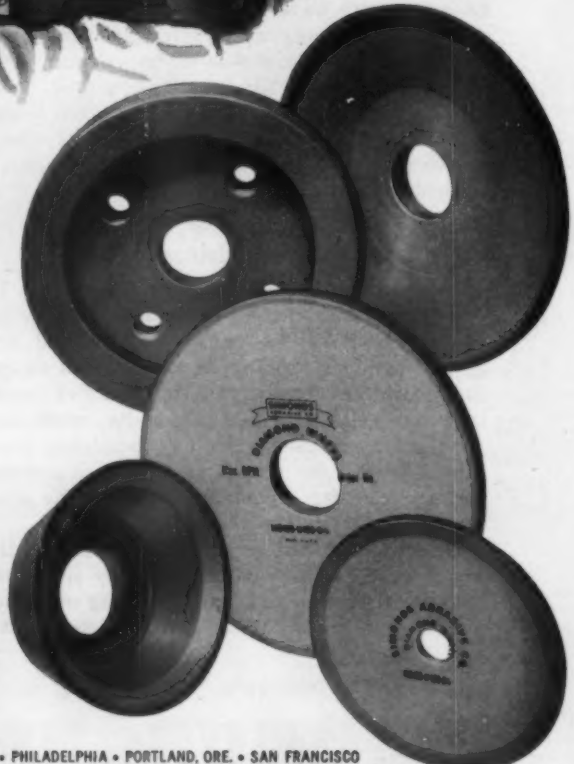

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Why a Machine Tool Exposition?

By Alan C Mattison
President
Mattison Machine Works
Rockford, Ill,
and President, National Machine Tool Builders' Association

America's machine tool industry will display the end-products of five years of intensive technological research this September as the sixth Machine Tool Exposition opens its doors at the International Amphitheatre in Chicago. More than 130 US builders will show upwards of 1000 latest-model machine tools to an anticipated audience of over 125,000 metalworking executives, engineers, and operating men.

The show grows

Held just once every five years, this greatest of all industrial shows has again outgrown the exhibit space of the International Amphitheatre. In 1955 a new Exposition Hall was added to house the fast-expanding fifth Machine Tool Exposition. That was not enough. A second new facility—Donovan Hall—has since been built to assure sufficient exhibit space for the 1960 Exposition. **This year, the $25 million worth of displayed machines, most of them under power, will cover more than seven acres.**

Two shows at once

Again in 1960, as in 1955, a Production Engineering Show will be held concurrently at Chicago's Navy Pier and will be devoted principally to control systems and other accessories and methods contributing to machine tool efficiency. Chartered buses will operate between the two shows, as well as to airports and downtown hotels.

Machine tool builders' installation crews will begin work on the exhibits as early as July 1, will put the finishing touches to displays on the eve of the show. It is estimated that roughly 880 carpenters, machinery movers, electricians, plumbers, maintenance men, guards and other personnel will be needed to set up and maintain the 1960 Exposition.

There is one basic reason why US machine tool builders are making this gigantic outlay in time and money, and why 125,000 busy metalworking executives consider time spent away from their jobs at the 1960 Exposition well spent—it is simply that a salesman cannot carry a machine tool around in a sample kit.

"Galloping Obsolescence"

Machine tool research and development go on the year round, and in the five years since the last Expostion, product R & D has accelerated to such a tempo that in many cases models of five years ago are obsolete, while models of 10 years ago are antiquated.

Everything new under one roof

There are in existence today new models of machine tools that will far surpass in productivity and accuracy anything seen before, but one of the industry's major problems is letting users see these machines at work.

Obviously, a machine tool salesman cannot carry a machine weighing several tons around with him. Nor can a builder construct a working model, say a little smaller than a typewriter, for him to demonstrate on a customer's desk.

Alternatively, production people from every metalworking plant in the country *could* visit every machine tool manufacturer to see new models at first hand . . . but who has that kind of time and that kind of travel money?

How much simpler to bring the latest models of all major US builders to one place, where users can go from booth to booth to compare performance and determine what type of machine is best suited to their individual operations!

Stimulates machine tool R&D

Such an Exposition also serves as a stimulus to technical advances within the machine tool industry itself—an industry that lives by obsoleting its own product. Each company at the 1960 Exposition must have ready for display machines that in one way or another are better than the machines it exhibited in 1955. As the September 6 opening approaches, product development accelerates to the point where the builder is actually committed to a public display of improvement.

What course can these improvements be expected to take at the 1960 Exposition? Here are a few general predictions:

- Many machines will be larger, more rugged, capable of doing more work in less time.
- There will be great advances in mechanical, electrical, and hydraulic controls—providing automatic operation, with the controls, rather than the operator, setting and maintaining the production pace.
- There will be more applications of numerical controls.
- There will be more machines capable of far greater accuracy.
- There will be remarkable examples of loading, unloading and transfer devices, which will eliminate hand operations, and reduce floor-to-floor time per piece.
- There will be new examples of machines performing multiple jobs.
- There will be demonstrations of machining new, tough metals.
- There will be new machining methods to see and evaluate.

Added up: the new machines can be expected to do more work, to do it faster and more accurately, with greater output, and with many operations automatically controlled. The 1960 Exposition will thus provide a working demonstration of cost-cutting methods.

To virtually every American metalworking manufacturer today, cost cutting is imperative, particularly in view of the increasing invasion of competitive products from abroad in the US market.

Lower taxes are not likely, nor is a reduction in the cost of labor and materials. That leaves increased productivity as the answer to cost reduction to meet an increasingly competitive market.

As of today, this nation's machine-tool-using industries have not taken anything like complete advantage of the potential of these machines. Too large a share of this country's production is still being handled on machines of antiquated design—machines costly to operate by comparison with today's models. The inescapable conclusion is that too many metalworking men are unaware of what new machine tools can do.

The place to find out: Sixth Machine Tool Exposition, International Amphitheatre, Chicago, September 6-16.

This . . .
Automatic tailpipe bender starts with straight tube and automatically completes shaped pipe. Under tape control, machine can turn out any one of 700 to 800 standard configurations or any special shape desired—up to 36 ft long

Replaces this . . .
Typical tailpipe warehouse is an expensively tangled jungle of pipes. In addition to extensive floor space for warehousing, considerable time is required to locate the exact model to fill an order

Tape-run machine lets distributors do their own . . .

Tube bending by the numbers

The Bend-O-Matic, a new numerically controlled tube-bending machine, may cause a marked change in manufacturer—distributor responsibilities. In the automotive field, for instance, a distributor of replacement parts can now make his own tailpipes, instead of ordering and storing a wide range of custom-shaped tailpipes from the manufacturer.

Advantages to the distributor (and to the original equipment manufacturer) are striking: Cost per tailpipe is more than halved; the new machine requires less direct labor, has a much faster production cycle; and the storage space taken up by large inventories of pre-shaped tubing is sharply reduced.

The application also provides a brilliant example of the far-reaching side effects created by the numerical-control concept. It started with an idea conceived at the Nu-Era Corp of Rochester, Mich, a manufacturer of replacement parts for autos and trucks, whose major line is exhaust pipes.

Developed and built for Nu-Era by Baldwin-Lima-Hamilton Corp, (at its Hamilton, Ohio division) the machine is equipped with a General Electric numerical-control system. From punched tape, in two minutes, it twists a length of straight pipe into a finished tailpipe—bent to shape and cut off—for any make or model of vehicle.

Although the Bend-O-Matic is built to form tailpipes, Edward Juelg, project engineer for B-L-H, says that adapting the dies of this machine for custom twisting of petroleum pipelines, electrical conduits, plumbing pipes, and hydraulic tubing is relatively simple. Among its other potentials, this kind of equipment could greatly broaden the service offered by distributors of pipe, tubing and bar materials. It ties directly to the increasing interest shown by industrial distributors in offering semi-finishing operations.

Replacement parts dealers distribute some 700 to 800 variations of exhaust pipe for autos and trucks on the road today. During 1959, for example, Ford added 22 new tailpipes to the total and Chevrolet added 21. The market for replacement exhaust systems was $360 million in 1959. To keep his customers, a dealer must be able to supply any make and model on demand. His inventory and investment problems are prodigious, and warehousing is extremely expensive: 12,500 formed tailpipes require 4300 sq ft.

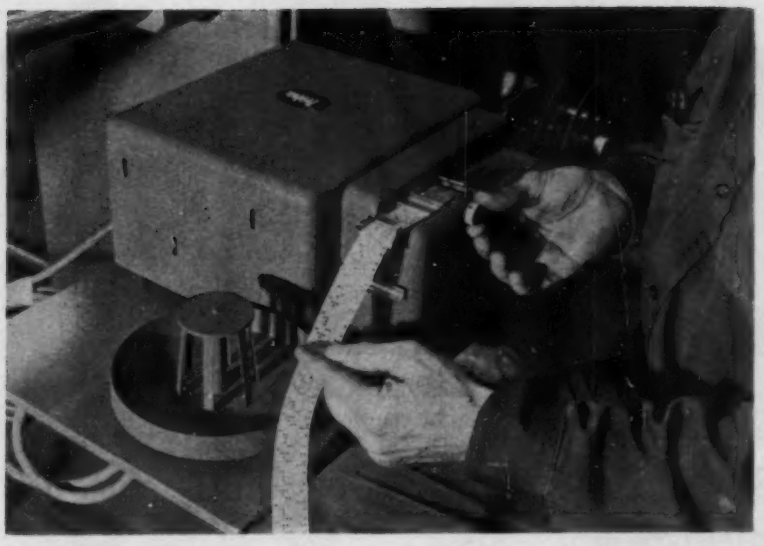
Conventionally, the manufacturer does the bending and ships the tailpipes out, shaped for installation. The average tailpipe contains eight bends; some have as many as 13.

Tailpipe manufacturing requires a series of single bends in straight tubing. The pipe is transferred to a number of single-function machines, each performing an independent bend and each requiring at least one operator during production.

How it works

Only four basic combinations of diameter and wall thickness comprise the entire range of existing models of tailpipes. For each configuration of pipe, it is necessary to record on tape only three factors: the length of feed between bends, polar rotation, and angle of bend. A one-inch, eight-channel perforated tape, about 18 in. long, is prepared on a Flexowriter for each tailpipe configuration. (Master tapes at B-L-H will supply a complete set of tapes for all forms to machine users.)

Once the tape has been placed in the machine's Friden tape reader and a length of straight tubing has been inserted, the operator presses a button. From this point until the completed tailpipe is carried away two minutes later, operation is automatic. A GE Thymotrol adjustable-speed drive controls length of feed



Tape determines shape . . .
All forming data is punched into tape supplied with machine. Once tape is inserted in machine, all further operations are performed automatically as soon as the operator presses a button. Simple die change makes machine suitable for bending other forms in pipe and tubing

and polar rotation; a rotary-drive hydraulic Rotac unit manufactured by Ex-Cell-O Corp controls the bending. Bends can be varied from 0.36 to 180 degrees. When the proper length of pipe has twisted through the machine, a saw cuts it off. Manually set switches can be used instead of the tape.

Because of the saw, sand—impractical anyway—or a mandrel can't be used to prevent the tubing from collapsing at a joint where bending exceeds the metal's elastic limit. Therefore a method called "progressive bending" was devised: Instead of making one quick bend of, say, 90 degrees, the machine curves the tubing a gentle 30 degrees, goes back and repeats another 30-degree bend, and completes the bend with a third pass.

For most machine tools a single design of servo drive is sufficient for all motions. On the Bend-O-Matic there was a definite need for two different designs. DC motors could provide for length feed and for rotation of the pipe, but a hydraulic drive was needed on the bending motion.

Pipe feed called for a positioning speed of 600 ipm, three times the top positioning speed of GE's normal machine-tool motion. An accuracy of ± 0.050 in. was required, so care had to be taken to eliminate a large overshoot normally resulting from high-speed positioning.

Pipe rotation is done with a straightforward positioning servo; the only design problem during its development was interlocking it with the other motions.

Pipe bending was the biggest problem. Because a high bending torque was needed, a hydraulic drive was selected. Normally, on a hydraulic drive for a machine tool, GE engineers recommend a proportionally controlled hydraulic servo valve. However, the accuracy of this bend, ±1.8 degrees, was not critical so to keep the drive simple a two-speed servo was used. This device allows fast movement with slow-speed approach and its performance is not completely dependent on machine characteristics.

Tape can be paper, laminated mylar, or mylar. Any one of a number of standard typewriters, such as Flexowriter, IBM, Remington Rand or Underwood can prepare the tape. Data handling has been interwoven with the machine and control functions. While the machine is operating from previous instructions, new data is being stored for the next operation. Also, while one part of the machine is performing its function, another part is being reset and readied to take the next step.

For original equipment manufacturers, the machine can produce up to 60,000 tailpipes a year, operating 250 days on a single, eight-hour shift. One of the major benefits of the Bend-O-Matic is in the savings in material costs. While the average wholesale price for a pre-bent tailpipe is about $2.10, the distributor's average cost for a 16-ft length of straight tubing is $1.75—and this length will provide two tailpipes. This reduces the unit cost to 87½ cents. The difference is $73,500 for 60,000 tailpipes.

Two or three men are normally required to handle tailpipes in a warehouse moving 50,000 units a year. With the tape-controlled machine, one man can handle at least twice the normal sales volume. The reduction of two men in the work force and the upgrading of a third man should provide an annual net saving of about $7500. In all, the Bend-O-Matic is expected to save the 50,000-tailpipes-a-year distributor about $55,000 net annually.

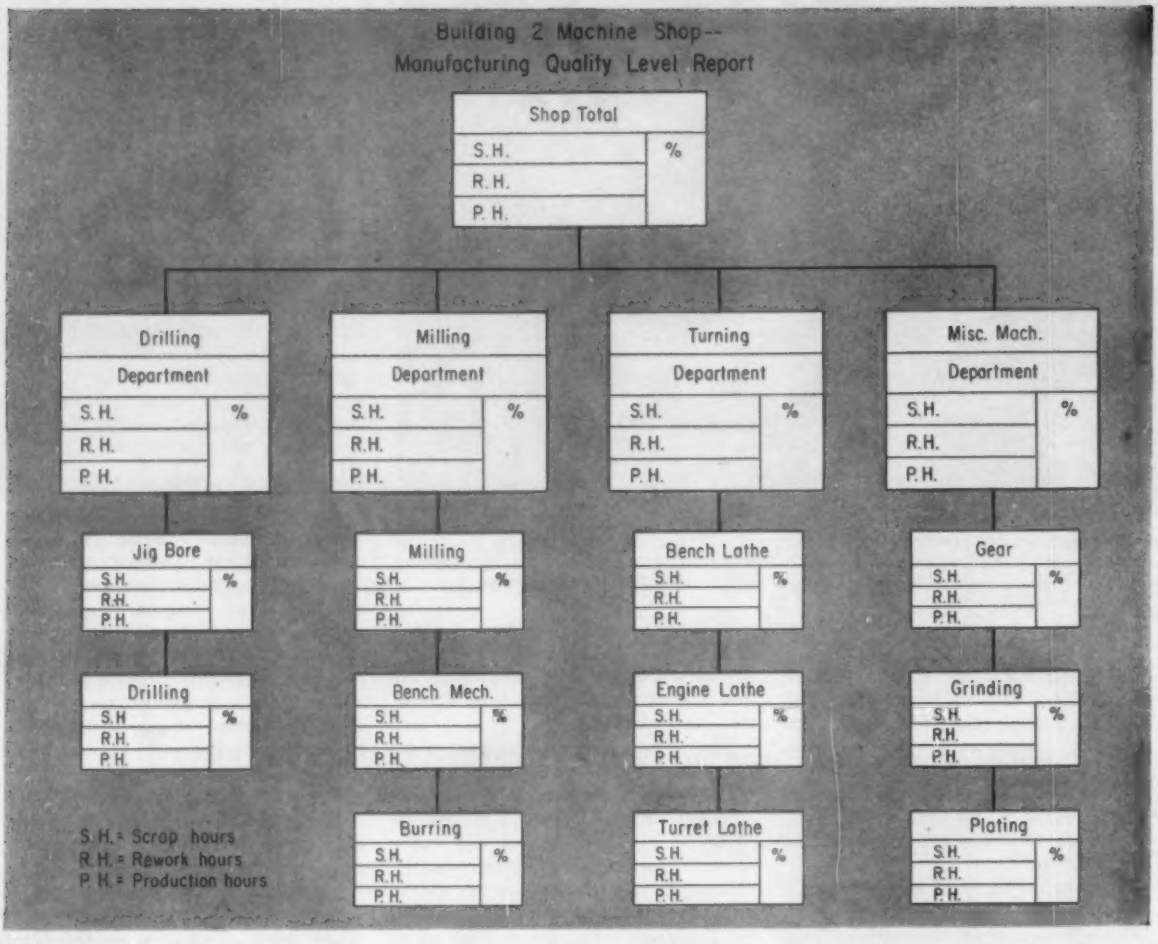
What will it cost?

The Nu-Era Corp does not intend to sell the Bend-O-Matic. No prices have been given. Instead, the company will lease the machine to distributors and original equipment manufacturers and will include with the lease a license to use it. The lease is expected to provide for service, maintenance and training. Each machine, capable of producing 50,000 to 60,000 tailpipes per year per shift, will lease for $25,000 a year.

Thus, a couple of men with a barn and about $50,000 to invest, plus some sales ability, can be tailpipe manufacturers. This possibility is made more significant because it is a product of numerical control in other areas. Two men on the West Coast are said to be building an entire job-shop venture around a single Milwaukee-Matic. There is little doubt that this new concept of manufacturing will have a widespread effect in the metalworking industry.

Take Nu-Era, for example. This company has virtually put itself out of the tailpipe business, except as a local user of its own machine, and into the business of machinery leasing. And it won't even manufacture the machines its licenses and leases. With the ability to mechanize skills and consolidate operations firmly established, people in metalworking are wondering how far point-of-sale manufacturing will reach; how much decentralization will result. What are the social and economic implications? Will more manufacturers put their know-how on tape and lease the tape to former customers?

Nu-Era anticipates that about 100 machines will be installed in the first phase of the program. Baldwin-Lima-Hamilton has built only the prototype. Production of commercial models will start in early spring.



Where waste occurs . . .
At a glance, top management, shop supervisors and foremen can see just where scrap and rework losses have occurred in the previous month, and their extent. Actual hours for scrap, rework and acceptable production are entered in the boxes for each department and the plant as a whole. Then, the M. Q. L. for each area is entered in its box. Also the M. Q. L. for the plant as a whole is plotted on a section of the chart (not shown), to show the trend month by month.

Quality-level reports spotlight trouble

By **William J Hill**, manager, Statistical Services Section,
Ford Instrument Co, Div of Sperry Rand Corp, Long Island City, N Y

Rework and scrap can't be avoided entirely. It's your job to find the causes and bring waste down to an acceptable figure

Successful reporting of quality must satisfy three requirements:

1. The quality level must be given in terms that are understood by top management, and that can be used by shop supervision to obtain better quality.

2. Quality information must be based on current reports that are readily available.

3. The system should be inflation-proof.

Wasted time is our yardstick. We say that for any department or any shop, the Manufacturing Quality Level can be expressed as:

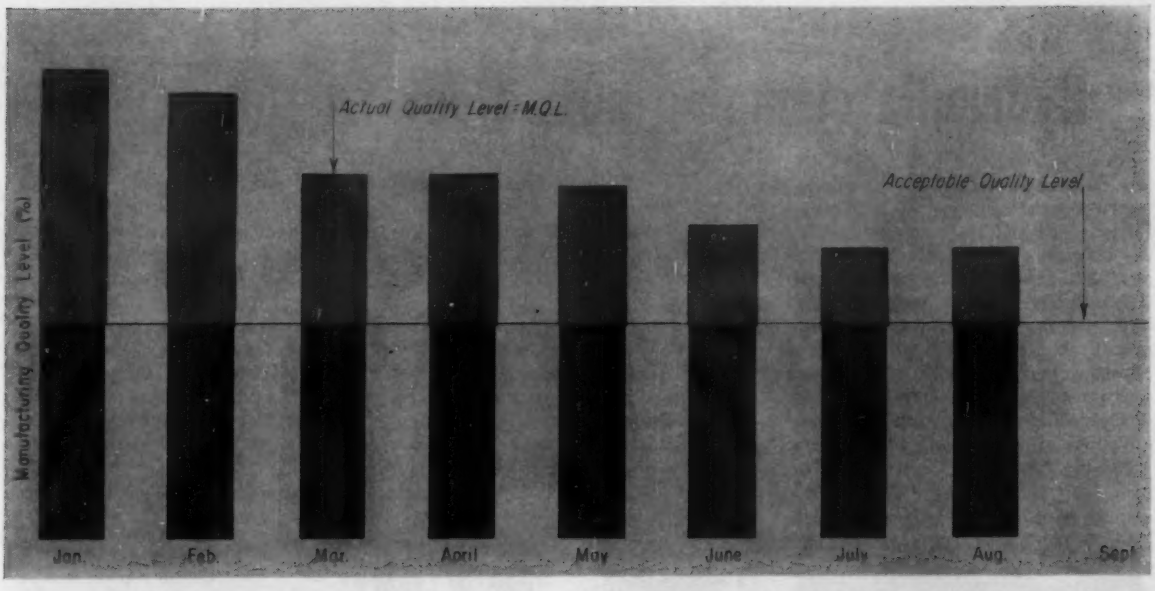
$$\text{M. Q. L.} = \left(\frac{S + R}{S + R + P}\right) \times 100$$

where:

S=Scrap hours
R=Rework hours
P=Production hours

In other words, scrap hours plus rework hours are expressed as a percentage of *total* time worked.

We know from experience what an acceptable quality level should be in a well-run department. In other words we can permit scrap hours plus rework hours to be a certain percentage of total time worked, and call this the Acceptable Quality Level. We then compare the figures for M. Q. L. and A. Q. L. and seek various ways in which to correct excessive discrepancies.



Losses pushed down . . .
A Quality Level Chart is prepared for each department and posted so that all employees can see how much the losses for rework and scrap exceed the bogey established by management. The allowed percentage is the Acceptable Quality Level, the actual level is the M. Q. L., or total height of the bar. In seven months, the response was such that unacceptable losses for scrap and rework were reduced 77%.

This system was put into effect a year ago because there are too many loose ends in the several ways that quality can be reported. Some people base quality on percent defective; others on defects per unit of material. These methods report one measure of the quality level, but not in terms that top management understands. If one department or plant has a quality level of 1% defective, is the actual cost higher or lower than for a department or plant with a quality level of 5% defective?

Analysis lacking

Realistic figures of hours spent on a given job, as well as rework hours, and cost of scrap are available from cost-accounting departments in most well-organized plants. This basic information is reported monthly to management, but without analysis that is immediately useful to detect quality trends.

You can get scrap hours, rework hours and production hours from Cost Accounting to prepare M. Q. L. reports for any department or the shop as a whole. Now you are ready to assemble monthly reports that spotlight the places where improvements should be made right away and the trends in quality level from such efforts.

Long-term value

Time is a better yardstick than dollars for this reason: If we report quality in terms of dollars and cents, we can expect that steadily creeping inflation will render useless any long-term comparisons. However, if it takes 2 hr. to make a part with a particular setup today, it will still take 2 hr. to produce the same part 10 yr from now with the same setup. Therefore, the most effective measure of quality is the percentage of total productive effort lost on rework or in the form of scrap.

Two simple reports

Every month, two simple reports are prepared:

1. The Manufacturing Quality Level Report—On this form there are boxes to enter scrap hours, rework hours and production hours for each department and its divisions, and the shop as a whole.

Rework hours are charged back to the responsible department. Example: if the toolroom spends considerable time in removing broken drills or in repairing improperly drilled holes, the rework time is charged back to the Drilling Dept.

If no one department can be held responsible for rework, the lost time is entered under "R. H." in the shop total box. The same applies to scrap. Thus, the totals for rework and scrap in the shop total box will always exceed the sums of such items for individual departments. In the case shown in chart on p104, the shop has four productive departments.

Almost all divisions use this Manufacturing Quality Level Report. Since its inception, we have noticed consistent improvement of the shop as a whole and in individual areas. Management uses the report to rate effectiveness of supervisors.

Our shop manager's office maintains a record of rework and scrap charged to each employee. These records are used to rate employees, to suggest those that require training, and to point out the individuals who require a warning.

2. The Quality Level Chart—From experience, we know the practical percentage to allow any department for time lost on rework and scrap. This figure is the Acceptable Quality Level. The Quality Level Chart shows actual performance each month, and thereby indicates the trend in performance. Foremen post these charts in the departments, explain their significance to employees. Facts like these stimulate employees to do better, because they can see that time lost on rework and scrap is not only costly but also reflects on their work.

Quality improvement

The two reports aid the Quality Control Dept. to seek out and determine the causes for repetitive defects. Analysis of such cases reveals the need for increased in-process checks or to assign more inspection coverage in certain areas. Our policy is to assign inspectors to in-process work, as far as possible, in order to prevent rework or scrap, instead of merely increasing end-of-line inspection to sort the good from the bad.

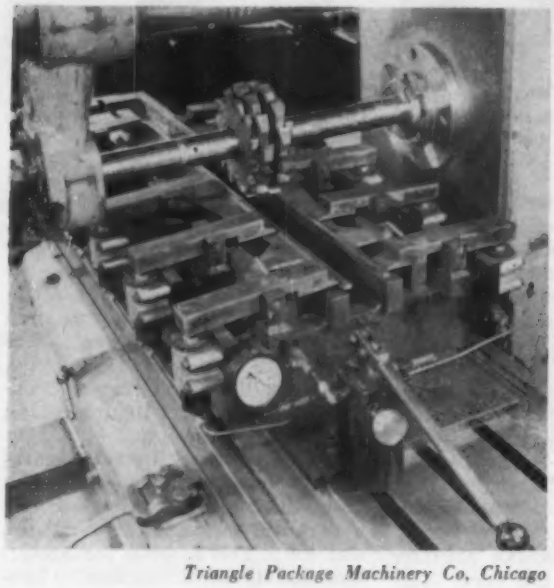
Hydraulic clamping cuts floor-to-floor time

By Rupert Le Grand,
senior associate editor

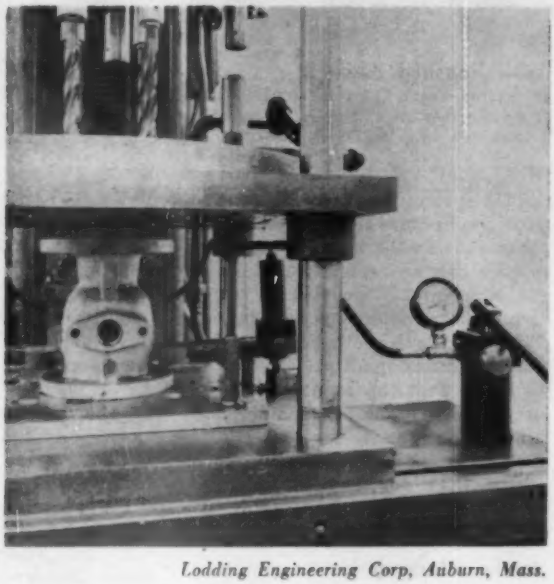
Rapid operation of clamps in jigs and fixtures is of paramount importance in short-cycle machining, welding, and assembly operations. Application of hand-operated clamps or straps can consume an unduly high portion of floor-to-floor time in modern processing operations. Furthermore, holding force is likely to be non-uniform and improperly applied.

In a hydraulic circuit, the pressure is uniform at all points. This fact was taken advantage of by the Newton Hydraulic Tooling Co, Auburn, Mass, in developing a closed-circuit tooling system. Components include hand-operated pumps, cylinders, needle valves, and swing clamps with built-in cylinder—all for operation at 2000 psi. These items can be connected together in simple circuits with ⅛-in. Joint Industry Conference flared fittings and steel tubing.

The time savings per cycle are obvious, when it is known that the system can be energized by hand pumping for a few seconds instead of placing straps in position on the work and bolting down. The savings become dramatic in nature when one considers that up to 120 clamps can be actuated at once from a single point—the machine operator's station. And the pressure in the circuit is self-maintained as long as necessary.



Triangle Package Machinery Co, Chicago



Lodding Engineering Corp, Auburn, Mass.

Castings milled three times faster without distortion

Guide rails for meat packaging machines are long, thin castings that are easily distorted by clamping. The job is to mill a top narrow surface square with the rail edge. Gang cutters are used to mill two parts at once.

Originally these castings, two at a time, were fastened with strap clamps. Production time for 75 pairs, including setup, averaged 141.6 hr, or 57 min. per pc.

The strap clamps were replaced with ten cylinders held by "horizontal" brackets fastened to the side members of the fixture and connected by the common piping to a lever type pump. The cylinders, of ⅞-in. bore and ½-in. stroke, each provide 1200 lb thrust upwards against fulcrumed clamps. Movement of the clamps is sufficient for easy placement and removal of workpieces.

Now, 75 pairs of guide rails are milled in 41 hr., including setup time, or 17 min. per piece, or a reduction in machining time of 70%.

Set-up time reduced 80% for drilling valve bodies

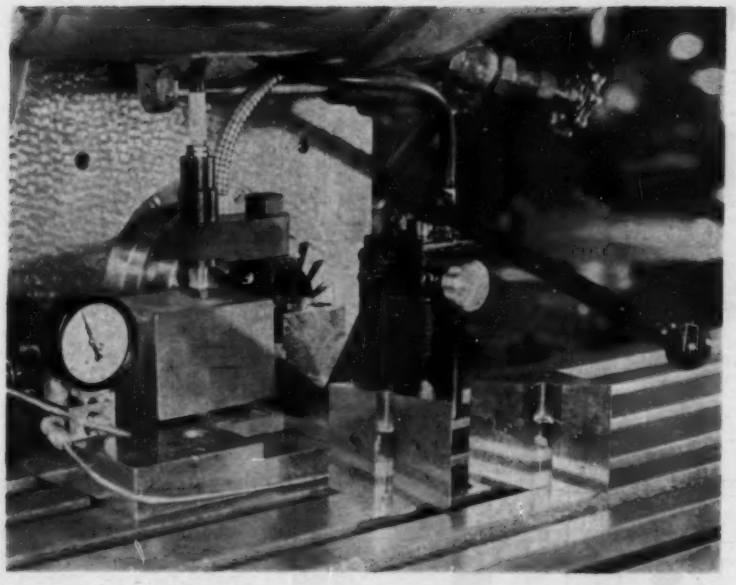
Bolt holes are drilled in several sizes of flanged valve bodies by means of a multiple drill. A comparison of ordinary clamping versus hydraulic clamping reveals:

OLD METHOD—Time to make a new setup, 22½ min. The operator had to select from 14 clamps and walk to opposite sides of the machine to install the appropriate pair.

NEW METHOD—Set-up time 4½ min. Two fulcrumed clamps are actuated by hydraulic cylinders. Their use saves an additional 1½ min. per pc. for tightening and removing straps from the workpiece.

Clamps have a 1-in. travel, for easy insertion and removal of work. A series of fulcrum-pin holes permits changing the reach of the clamps, according to work diameter. Each clamp is spring-returned to the open position when the hydraulic clamping pressure is released.

Because of a total saving of 157 min. per day, the new clamping arrangement paid for itself in two weeks.



Die blocks milled square in self-contained fixture

Four sides of a die block are milled square in this fixture, after top and bottom are ground parallel.

Two hydraulic clamps, a lever pump and the pressure indicator are built into the fixture. To hold the part down, one swing clamp is centered over the bottom rails in the fixture. The second clamp, at the left, pushes the block against the side rail in the stop block at the right of the fixture. Clamping effort resists the pressure of slab milling ¼-in. from the die block. After one surface has been milled, it is placed against the side rail to insure squareness with the first side. In like manner, the third and fourth sides are machined, using the previously milled surface for squaring.

Tooling components for hydraulic clamping system

Hydraulic clamping circuits are developed from these basic components:

PUMPS ARE MADE IN TWO TYPES:

Screw-type pumps are of low capacity—1.57 cu in. and 6.2 cu in. They are non-vented, merely displace the reservoir contents through the system, and thus can be placed in any desired position. Clockwise rotation of the handle builds up pressure to 2000 psi; counter-clockwise rotation relieves pressure.

Lever-type pumps are of larger capacity—10 cu in. and 20 cu in.—to operate a greater number of clamps, up to 120 in some cases. These pumps are vented, thus cannot be tilted more than 30° to the vertical. Pressures of 2200 to 2500 psi are created by up and down strokes on the handle. A hand-operated relief valve is turned clockwise to lock and maintain pressure indefinitely in the system; counter-clockwise to relieve pressure when the fixture is to be unclamped.

By incorporating a needle valve in the circuit, one or more cylinders can be actuated at will.

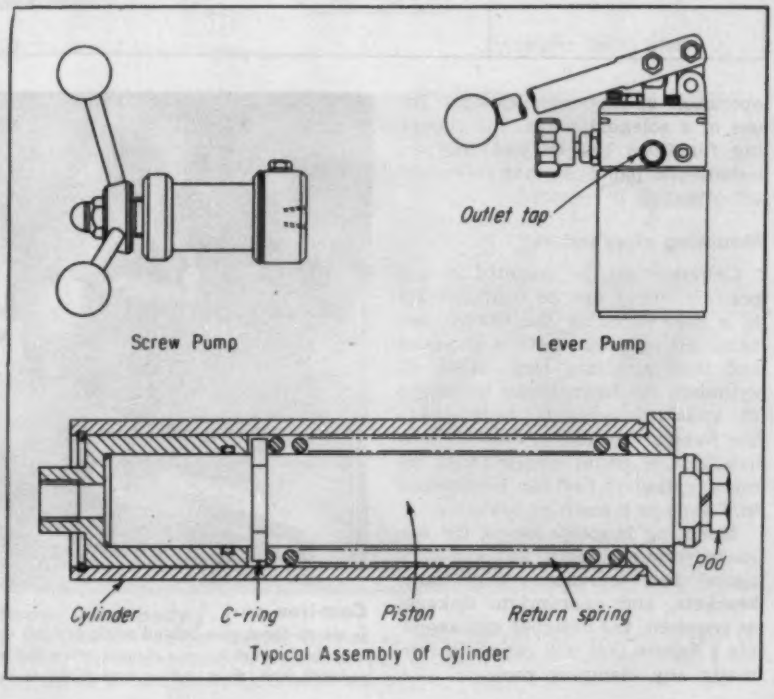
CYLINDERS—Four sizes are available, two with ⅝ in. bore to provide 600 lb thrust and two with ⅞-in. bore to provide 1200 lb. thrust, at 2000 psi. Small and large cylinders are available with ½ or 1-in. stroke.

Each cylinder contains a spring-loaded piston, which controls outward travel of the plunger, and which retracts the plunger when pressure is released from the system. Normally, a flat hardened pad is provided with each cylinder, but hardened spherical buttons and yokes are available. Each piston has a ½-in.-deep, 5/16-24 UNF tapped hole for attachment of pads that the tool engineer may design.

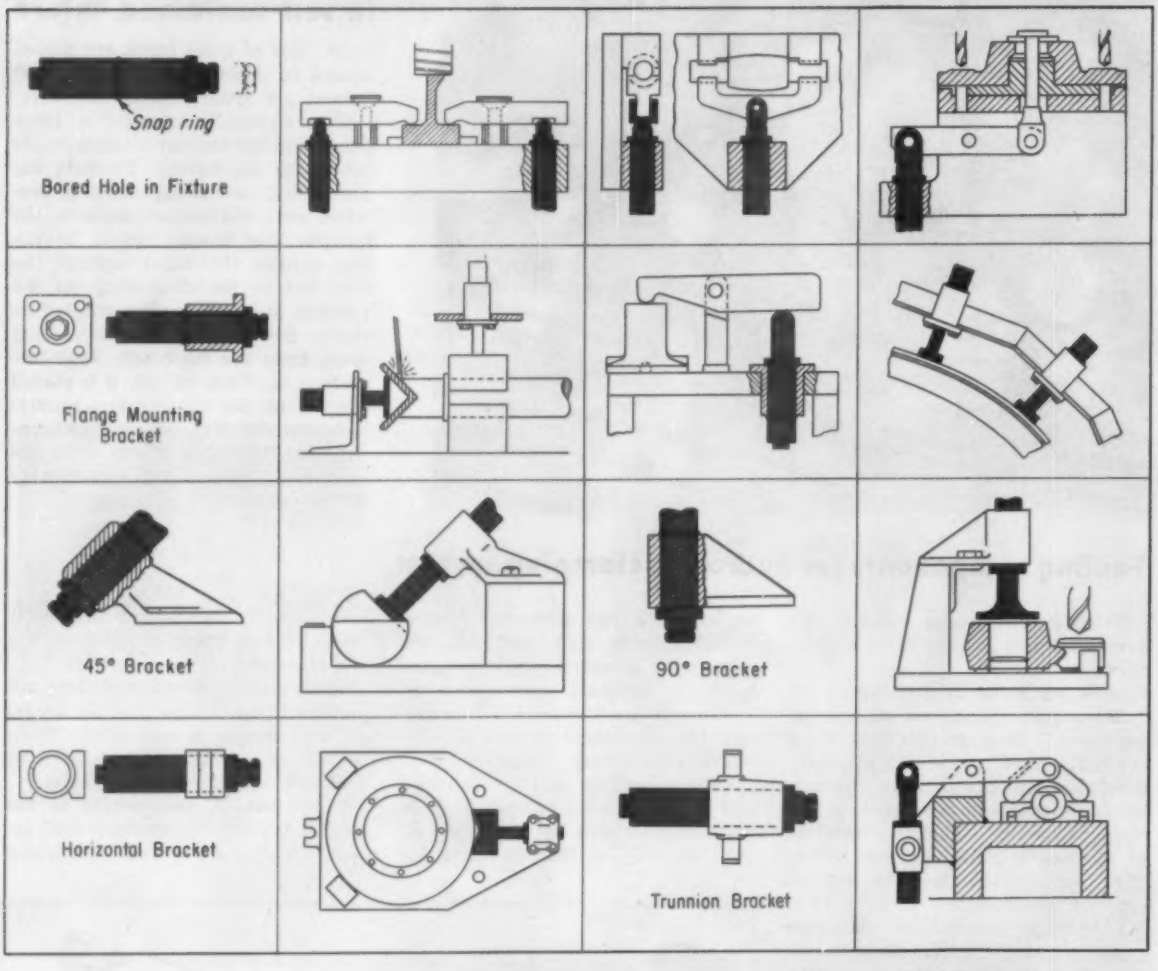
Return springs in the cylinders will lift 30 lb in the case of the ⅝-in. bore cylinder and 100 lb for the ⅞-bore cylinder, so that clamping elements can be freed from the work. These figures apply at 100% spring compression.

Much time is saved in fixture operation if the full ½ or 1 in. travel of the pistons is not used. Withdrawal of the plungers by 1/16 in. will generally free the workpiece.

INTENSIFIERS—These operate at 100 psi air pressure to produce 2200 psi in a hydraulic system for rapid



Typical mounting methods for cylinders

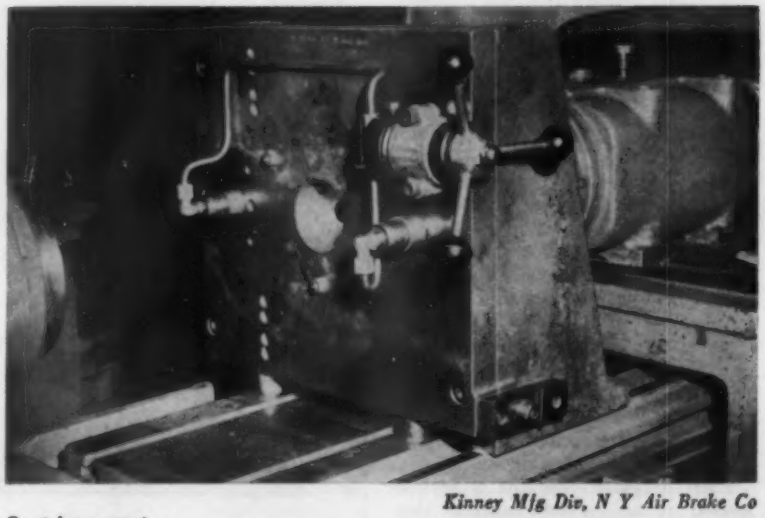


operation of numerous clamps. By use of a solenoid valve, the clamping functions can be tied into an automation panel, so that no operator attention is required.

Mounting of cylinders

Cylinders can be mounted in any position. They can be held directly in a hole bored in the fixture, because all cylinders have a shoulder and snap retaining ring. Also, all cylinders can be mounted by means of standard brackets fastened to the fixture. Moreover, there is now available a swing clamp (with integral cylinder) that can be fastened to T-slots in a machine table.

Mounting brackets are of the following types: flanged, 90°, 45°, horizontal and trunnion. With these brackets, and appropriate linkages as required, the designer can assemble a fixture that will cope with virtually any clamping problem.



Kinney Mfg Div, N Y Air Brake Co

Cast-iron part . . .
is set on three pins behind angle bracket on precision boring machine. Two cylinders set into the bracket actuate clamps, when the screw-type pump is operated. Clamping time is reduced 90%, floor-to-floor time 67%, as compared to applying clamps by hand

How to Design a Clamping System

JOB—To plane bottom surface of dish-shaped casting (40 in. long, 8 in. deep; weight 500 lb) clamped to planer table. Maximum cutting thrust, 2000 lb; safe clamping force on work at any point, 1400 lb.

The setup shown is purely schematic for the purpose of showing how clamp selection is done. Obviously, the machine table would not be bored for cylinders; a subplate would have to be used. A more simple arrangement would be to substitute Newton's hydraulic self-contained swing clamp that can be fastened to T-slots directly.

HOLD-DOWN CLAMPS—The clamping force supplied by strap clamps or self-contained swing clamps should be capable of resisting the tilting moment of the cutting thrust. This moment equals cutting force (2000 lb) times height above table (8 in.) equals 16,000 in.-lb.

A cylinder with a ⅝-in. bore, ½ in. stroke, has an area of 0.3 in., therefore provides a force of 600 lb. at 2000 psi oil pressure. If the proportions of the strap are: $A = 6$ in. and $B = 7$ in., the effective clamping force $= A/B = 600/X$, and $X = 700$ lb.

One clamp provides resistance to tilting as follows; 700 lb. times length of work (40 in.) = 28,000 in.-lb. For good proportion we will use two swing clamps at each side. The effective moment of the two end clamps = 56,000 in.-lb, or nearly four times the tilting moment.

Instead of strap clamps, we could effectively use the automatic swing clamp, which produces 900 lb thrust and is easier to apply. In operation, a horizontal cylinder, not shown turns the clamp 90° to the clamping position against resistance of a torsion spring. Next, the vertical cylinder shown applies clamping force. When pressure in the system is relieved, both cylinders return to their original positions and the clamp swings 90° from the work.

LOCATING UNITS—The heavy piece must be pushed against the stops before clamping. The universal head shown, if used with a ⅝-in. bore ½ in. stroke, cylinder would provide a push-up force of 0.3 x 2,000 = 600 lb. Resistance to sliding of the workpiece equals weight (500 lb) times coefficient of friction (say 0.2), equals 500 x 0.2 = 100 lb. Therefore, one push-up cylinder per side should be ample.

In the piping layout, needle valves would be used to sequence push-up and clamping pressures.

PUMP SIZE—Total displacement of hydraulic fluid to actuate all cylinders may be summarized as:

Push-up cylinders:

2 x 0.3 x 1 in. stroke = 0.6 cu in.

Clamping cylinders:

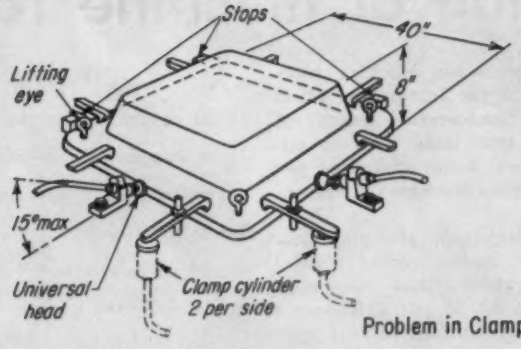
8 x 0.3 x ½ in. stroke = 1.2 cu in.

1.8 cu in.

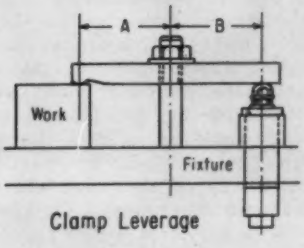
Rules of Thumb for Cylinder Applications:

Two ½-in. bolts — replace with two 600-lb. thrust cylinders.

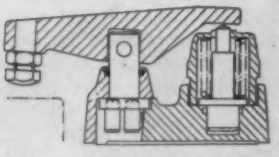
Two ¾-in. bolts — replace with two 1200-lb. thrust cylinders.



Problem in Clamping



Clamp Leverage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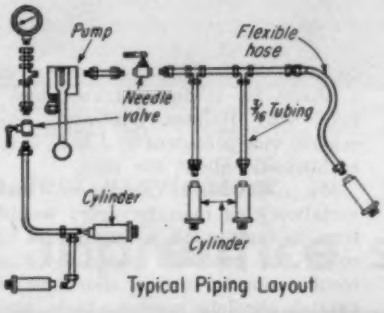
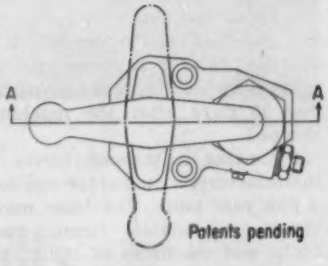
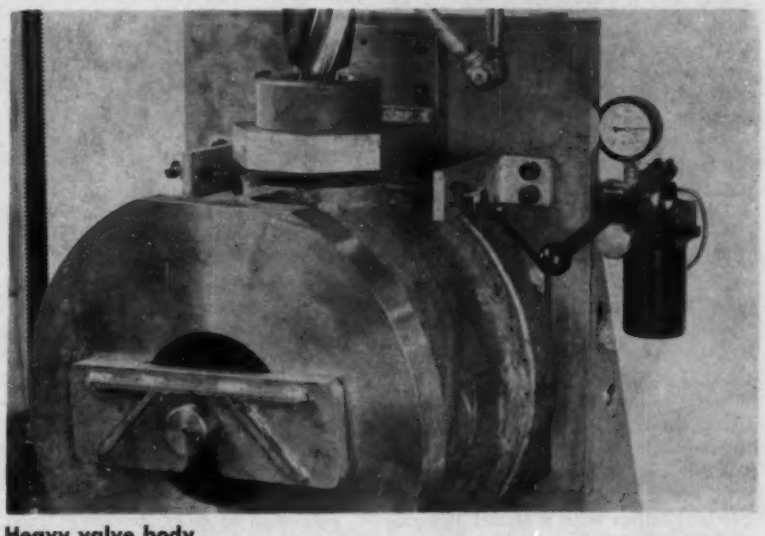


Typical Piping Layout



Automatic Swing Clamp



Heavy valve body . . .
is slid onto locating-type drawbar actuated by cross bar and two cylinders at rear of bracket. Pull on strongback is light while part is located radially, applied at full pressure during the cut. Clamping time, 30 sec

J & L offers "no down payment" leasing of machine tools

A leasing plan for machine tools with many of the features of plans used for commercial leases of vehicles—a true lease with no option to buy—is being offered by the Jones & Lamson Machine Co, Springfield, Vt.

Further details on the plan now confirm the earlier report (*AM*—Jan 25 '60, p109) that the rental cost will be $20.50 per $1000 on a five-year lease. On the five-year lease this will amount to the cost of the machine plus an interest of 23% (about 4½% per year).

In the first week in which the "Profitivity Lease Plan" was offered, interest was shown by companies approached and a number of leases are said to have been drawn.

Typical Monthly Rates (5-year lease)

FC-30 optical comparator	$246.00
16-in. Fay automatic lathe	676.50
Numerically controlled positioning table	615.00
Turret lathe	510.00
Model 30 automatic tracing lathe	922.50
Model E-2 form grinder	656.00

How the plan works

The standard lease will be for five years. Leases can be drawn for different periods, but the monthly rate will vary in such cases, from the standard $20.50 per $1000. No security deposit or down payment is required. The first payment is due 30 days after the machine is shipped.

Financing is through banks. The manufacturer's guarantee applies on a five year lease. The lease may include expendable items, special tools, and machines of other manufacturers needed to complete the modernization of a production line. J & L will not encourage the use of "packages" that consist mostly of other equipment, but it evidently has no objection to the inclusion of non-competing machine to modernize a line.

The lessee will be responsible for maintenance and repair of equipment and insurance coverage but will have no other obligations. At the end of the five-year period, the lease can be renewed at one-third of the original rate.

In the course of a five-year lease, the lessee will have paid an amount equal to the cost of the machine plus 23% in interest. But all this will have been paid as an expense item and during the period in which the machine was operating.

Visualize an axle manufacturer who could replace seven old multiple-tool lathes with a Model 30 automatic tracing lathe at a reduction in laboh costs of $2400 per month. The price of the lathe, fully equipped, is $45,000. This would be an attractive replacement—provided the company had $45,000 in capital available.

But if the capital was not available, the company could lease a Model 30 for $922.50 per month. This would be an item chargeable, for tax purposes, in exactly the same way as labor costs and would be more than offset by the $2400 per month reduction in labor cost.

As an example of leasing this is mythical, though Howard Finch, manager of marketing of J & L reports that an axle manufacturer recently obtained such economies on a Model 30. It demonstrates, however, why Holmes Whitmore, executive vice president of J & L, is so enthusiastic about the plan.

Mr. Whitmore predicted that metalworking manufacturers would turn to leasing on a mass scale to solve the problems posed by the combination of critical shortages of capital, obsolete machine tools, and tax laws that impede investment in new equipment.

"Complicated and intricate tools are expensive. Many small firms, for example, find it hard to make even a down payment for leasing them on existing lease plans," he said.

Lease plans for machine tools have been offered for a number of years, but an initial payment, usually ranging from 10 to 25% of the machine price has generally been required. Most plans have included an option to purchase.

Some companies have pushed leasing plans, but most have used them as a sort of "showcase" to interest purchasers, then tried to sell the customer on buying instead.

In J & L's new plan, salesmen and distributors will receive the same commission for executing a lease that they will receive for making a sale. The plan is frankly admitted to be designed to take full advantage of the provisions of the income tax laws and to avoid the handicaps of purchase under the long depreciation schedules required by Bulletin F.

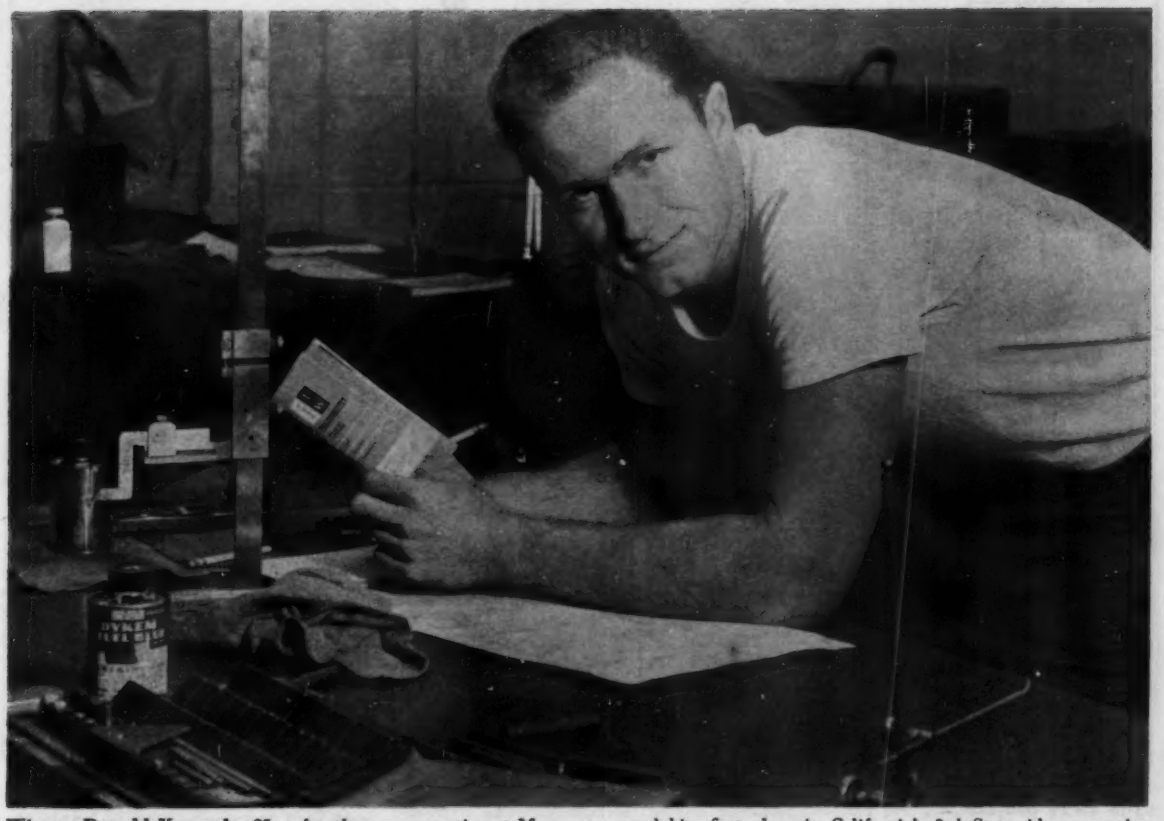
An added reason for pushing leasing, says Mr Whitmore, is that it would be "difficult for foreign manufacturers of machine tools to lease direct to US customers."

Now... vapor-deposited tungsten

Vapor deposition offers a simple method of plating high-purity tungsten on metal surfaces through a new process developed by the National Bureau of Standards. By this method, it is possible to coat simple and complex surfaces with tungsten purer than commercial grades and the deposited metal has the theoretical density of pure tungsten. Hardness of the deposit at 650 C is Vickers 475; at 900 C about Vickers 410.

Adhesion to molybdenum is good; to copper, somewhat weaker; and to iron rather poor. The tungsten-graphite bond was as strong as graphite itself and tungsten deposited on ceramics also showed good bonding. Deposits 1/16 in. thick were obtained in an hour—about 60 times as fast as plating from fused salts by electrodeposition.

Plating is accomplished by reducing gaseous tungsten hexafluoride with hydrogen by passing it over the heated object to be plated. At temperatures above 570 F tungsten is deposited on the hot surface. A similar method has been developed independently by the Bureau of Mines, which has also come up with a ductile tungsten it can't yet explain.



Winner Donald Kennedy, 25, a fourth-year apprentice at Menasco Manufacturing Co, plans the sequence of operations that earned him first place in California's 3rd Statewide apprentice contest (see photo below)

California's statewide contest provides a . . .

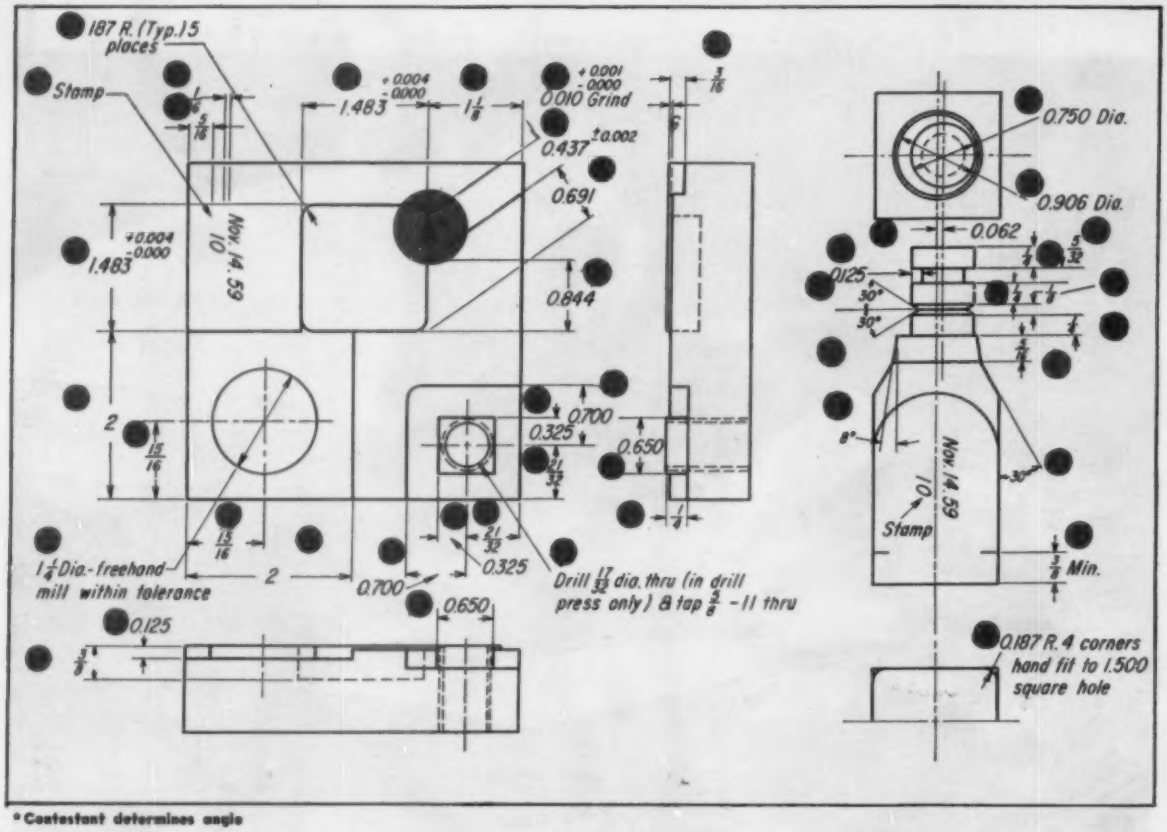
Yardstick for apprentice skills

Shooting against par of 500 for a perfect score, a fourth-year machinist apprentice racked up 480 points on the test problem for the 1959 California Statewide Apprentice Contest. That's a pretty impressive showing for any metalworking league. Impressive, too, is the overall average of 415 points gained on the test by the seven finalists.

The contest, sponsored late in 1959 for the third time by the Southern California Tool & Die Association, is renewing and intensifying interest in machinist and tool and die apprenticeship on the part of employers, state and school officials, and young people planning a career in metalworking. Contest objectives are fourfold:

- To stimulate apprentices to seek greater proficiency in their craft.
- To encourage employers to increase the diversity of training.
- To encourage greater participation on the part of employers who

Top apprentice Kennedy (center) displays his Statewide Apprentice Championship trophy (he also got a $100 savings bond). With him (left), holding 1959 employer trophy awarded Menasco Manufacturing Co, is Contest Chairman William W. Young of Die Cast Mold Co, and Frank Fenger, Menasco VP Manufacturing, who holds rotating employer trophy which Menasco will keep for the balance of the 1959 contest year



*Contestant determines angle

The 1959 project . . .

Contestants were given 8 hours to complete this project, broken down this way: Lathe 2 hours, Handwork 40 minutes; Layout, Milling and Trigonometry 4 hours and 40 minutes, Grinder 20 minutes, Drillpress 20 minutes. Unless otherwise specified, limits on dimensions were: Decimal ±0.005, Fractional ±1/64 in., Angular ±½ in. Break all sharp edges. Word "stamp" on drawing refers to "stamp date and apprentice number in ⅛-in. characters"

Here is the point-by-point scoring of the 1959 contest problem

(Refer to the corresponding number in red circles in drawing above. "Points earned" column below is the actual score of third-place contestant Norman Oellerich)

DIMENSION	POINT VALUE	POINTS EARNED	DIMENSION	POINT VALUE	POINTS EARNED
1	10	10	24	5	5
2	10	10	25	5	5
3	5	0	26	25	20
4	5	5	27	5	5
5	15	11	28	10	10
6	5	5	29	10	10
7	10	10	30	35	35
8	5	5	31	10	4
9	15	10	32	10	10
10	5	5	33	15	15
11	5	5	34	5	5
12	5	5	35	10	10
13	5	5	36	10	10
14	15	14	37	5	5
15	25	25	38	5	5
16	25	25	39	5	5
17	15	13	40	10	10
18	20	18	41	5	5
19	5	5	42	10	10
20	10	10	43	15	15
21	20	20	44	15	15
22	5	5	45	5	3
23	15	15	46	15	8
			TOTAL	500	461

draw from metalworking's pool of skilled manpower without contributing to it. (In plain English: to discourage pirating of skilled men).

- To provide industry with a formal opportunity to analyze the effectiveness of apprentice programs.

Each year, the Statewide Contest is the climax of a series of local Joint Apprenticeship Council subcontests, and each of the finalists (seven in the 1959 Contest) are winners of local JAC contests. Entrants must have completed more than three but less than four years of either a tool and die or machinist apprenticeship course, and must be able to "meet minimum scholastic standards relating to his craft."

Statewide finals call for an apprentice to machine a project designed to test his ability on two major counts—speed and accuracy. Such projects, which vary from year to year, are primarily geared to test contestants' knowledge of milling and lathe techniques, although they include handwork, layout, trigonometry, grinding and drilling, too.

Projects for contest finals must adhere to strict requirements. For example, the project must involve machining of a part other than an everyday normal production job. Parts must be so designed that each machining operation is performed in sequence. This enables contestants to proceed from one phase to another without backtracking.

Not only that, the project must test the overall capability of the apprentice while at the same time involving skills that are common to both the machinist and the tool and die maker.

Thus the men who design test projects for the statewide finals make a special effort to call for machining operations that are within the grasp of the third-year apprentice, but which at the same time give participating apprentices the satisfaction of completing a challenging assignment. On the other hand, projects geared to the skills of only exceptional apprentices would overchallenge contestants to the point of frustration.

Superior apprentices do get their innings in the final project, though, by being able to demonstrate their skill by their speed and excellence of finished product.

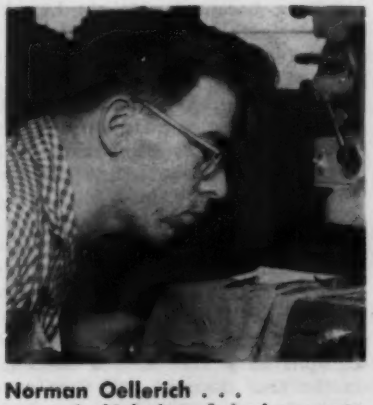
Contest procedure

Contestants are allowed 15 minutes to study the project drawing before they begin machining the piece. After this, each contestant is

Judges had this to say about performances of 1959 contest winners...

Checking winner Donald Kennedy's work . . .
. . . is contest chairman William W Young. Excerpts from the four judges' comments on how Kennedy handled the test problem: "Started the job with utmost confidence and proceeded very methodically as each step was planned . . . Used safety precautions and did a very good job . . . Finished lathe work in 1 hour, 40 minutes (maximum allotted time: 2 hours) . . . Made careful check of setup and facing of grinding wheel, but part had warped beyond tolerance as a result of milling, so he was allowed five minutes more for checking, etc . . . During grinding, exercised care in centering hole . . . Operated at reasonable speed."

Runner-up David Simpson . . .
. . . merited these comments from judges: "Studied his print and went to work, and never did seem to be in doubt as to procedure . . . Had difficulty with the 60° angle cut and lathe chattered, but finished lathe work in 1 hour, 40 minutes . . . (Drilling and tapping) Made sure table clean, cleanup and safety good . . . Several minutes spent trying to find the proper table bolts and tap handle because shop unfamiliar to him."



Norman Oellerich . . .
. . . took third place. Judges' comments: "Was quite slow (on lathe work) at first, but then progressed very well . . . Used care in seeing grinding wheel was dressed, cleaned equipment, but did not complete grinding because he failed to consider rotating part on magnetic chuck . . . Also lost time because unsure whether to grind in one direction only. (Drilling and tapping) used maximum-sized drill but operated with caution."

given time to familiarize himself with machine controls to the extent that he can proceed with complete safety. Judges (four in the 1959 contest) are assigned to evaluate the work of apprentices during each machining operation.

Judges record the exact starting time and total time required for each contestant to perform each operation. (Timetable for each sequence of operations will be found in the caption for the project drawing on page 112).

No help of any kind

Contestants are judged on workmanship, safety, sequence of operations and such other factors as may indicate the thoroughness of their training. Judges do not assist the contestants in any way other than to insure that their machines are working perfectly and safely. Immediately following the contest, projects are submitted to an inspector who checks them against a working drawing (see drawing and checkpoints on p 112).

Project carefully guarded

Until the day of the competition, the exact nature of the project remains a carefully guarded secret. The judges, for example, do not see the project drawing until the morning of the contest. And the project inspector is not permitted to attend the contest while the competition is in progress: nor is he able to identify completed projects as belonging to one or another of the competing apprentices, because parts are keyed to contestants only by number.

As a further safeguard against any form of unfair advantage, the apprentices are kept by themselves during any rest periods during the contest. This makes it impossible for them to get outside aid or advice while the contest is on.

Project grades

Although it is the inspector who in a large measure determines the contest winner, judges' reports (see comments under prize winners, photographs on p 113) have a bearing on the final decision, and they are invaluable in "Monday morning quarterbacking" sessions to determine what is good and what is lacking in apprentice programs.

Site of the 1959 contest was Peerless Engineering Co, South Gate, which also was host to a preliminary contest held by the Los Angeles Joint Apprenticeship Council. It is vital that the contest shop be equipped with a representative variety of machine tools found in most shops, so that contestants can choose the machines that are most familiar to them.

A contest of such scope requires considerable planning and cooperation among local industrial groups and companies, state officials, and schools. For instance in 1959 local metalworking companies helped out by supplying cutting tools, project designs and materials, and final inspection facilities, while the State of California contributed consulting and clerical aid.

The lift that California's apprentice contests have given to the prestige of the metalworking industry, to the morale of the apprentices themselves, and to the public image of the skilled "blue collar" worker has exceeded expectations.

Valuable lessons learned

But even more far-reaching in its implications for the future of the metalworking industry is the critical evaluation of the merits and deficiencies of apprentice training that such a contest makes possible.

For instance, here is an appraisal of apprentice performance made by 1959 contest judges:

- "It has been noted that most apprentices are not well versed in the use of sine tables. On some projects, the degree of an angle was purposely omitted, leaving only the two known sides. Instead of computing the angle, the contestants would determine it by layout and/or protractor.
- "Noted also was a curious deficiency in knowledge of how to hold and accurately start a tap. Having made a proper setup and having drilled a hole, the contestants would then remove the part from the drill-press and start the tap by hand at the bench.
- "Another obvious shortcoming was the inability to cut threads on a lathe. Many contestants did not know when or how to engage a half-nut, and very few of them knew that the number of threads per inch would affect this.

Weakness in speeds and feeds

- "There is unanimous agreement among the judges on the subject of speed and feeds. Few if any of the competing apprentices seem to know the capacity of a given machine. Most, if not all, of them made cuts very cautiously when the known factors dictated a depth of cut and a rate of feed three or five times greater. This applies to a milling machine in particular, also to lathes and grinders.
- "Normally, a contest project includes hand filing of a small portion of stock. Most competing apprentices failed on this—an indication that the journeymen to whom they were assigned during training failed to show them simple tricks of filing a straight line or a flat surface.

Trouble with offsetting

- "This year [1959], the lathe operations of the project included an offset from one dimension to the next. Ample stock was provided, so this should have presented no problem. But those judges who recalled having done our "jig boring" on the face plate of a lathe found it difficult to understand how so many of the apprentices could have been confused by this.
- "In every case, judges of the precision grinding operation found a serious lack of training in the selection, handling, and dressing of grinding wheels.
- "Most competing apprentices approached the job as a whole with uncertainty. Few seemed sure of the sequence operations, even though the project was so designed that no particular operation necessarily followed another. But this could well be the fault of the Project Committee in failing to allow enough time for study of the drawing.

Some safety faults

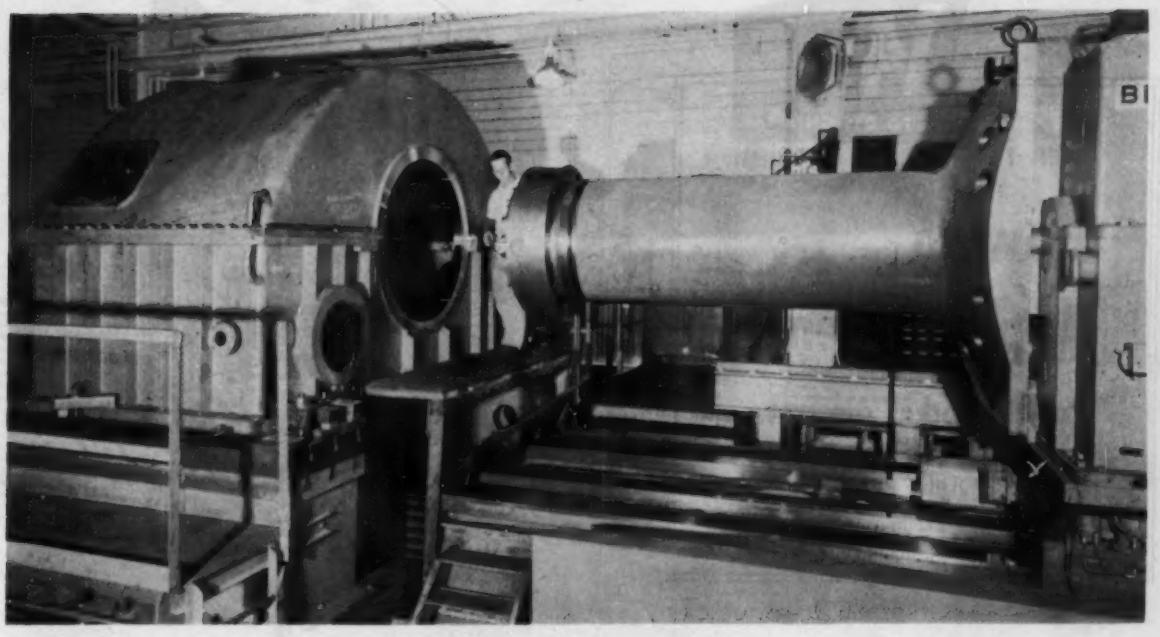
- "Finally, safety habits generally were good. But in many instances the apprentice displayed a disregard for his fingers by measuring a part in the milling machine while the cutter was turning. Freehand grinding in all cases was done without the use of face shield or safety glasses—even though they were provided."

Human quality control

Those are possible faults in today's metalworking training brought to light in the 1959 contest. They are not irremediable. Their subsequent correction will bring apprentice training closer to the goal outlined by Contest Chairman Bill Young:

"As each of us in our individual shops strives to improve the quality of our product, so should we strive to improve the quality of our skilled manpower.

"Since we periodically review our quality control procedures for better methods, it seems logical that we should apply this basic idea to our apprentice training."



A new approach to machining turbine casings . . .

Move the tools, not the work

With the installation of a huge horizontal boring and facing machine, the General Electric Co has improved its efficiency in machining turbine casings and has reduced by 50% the floor-to-floor manufacturing cycle time.

Accepted practice today is to machine turbine casings on a vertical boring mill, with the workpiece supported on end and rotating around a stationary cutting tool. And until recently this was the way it was done at GE's Medium Steam Turbine, Generator and Gear Dept, Lynn, Mass. However, when demand for turbine casings increased, GE found itself limited by the slow machining speeds of the VBM's (about 75 sfpm or less, because a man had to ride the table to check on cutting tool performance) and by lack of floor space. In addition, this method prevented the use of carbide tools and the latest cutting techniques.

Analyzing the problem, General Electric decided that the best approach would be a special horizontal boring and facing machine that could machine the interior surfaces in high pressure turbine heads and exhaust casings. As the result of a coordinated effort between General Electric and the Consolidated Machine Tool Div of Farrel Birmingham Co, such a machine was built and installed at the Lynn plant.

This 250-ton machine operates in a horizontal position, with the workpiece held stationary in its normal operating position, and the tools rotating inside the workpiece.

Fastened to the sliding head and extending 100 in. into the workpiece is a heavy support for mounting several sizes of boring and facing heads. This permits facing to a maximum diameter and also permits the boring and facing of different surfaces inside the casing. Because of the extreme accuracy required, it was necessary to machine and assemble the head and the support then correct for deflection at the end of the spindle extension. The principle of constant distance from the point of support to the cutting tool contributes to the straightness of bores and squareness of facing cuts.

The cutting heads range from 12 to 60 in. diameter; some are equipped with single tool slides, others with four tool slides for multiple cutting. There is also a special head for spherical boring. The carbide tools can be preset in the slides before the cutting head is mounted.

An auxiliary outboard bar support, mounted on a separate base, has vertical and horizontal adjustments and is equipped with an optical device for aligining it with the headstock spindle.

Spindle speeds range from 1 to 200 rpm. Currently, the machine is operating at about 400 sfpm, to an accuracy of within 0.001 in., and it provides a surface finish of 32 microinches or better.

The control system is completely automatic and is designed so that, at a later date, it can be set up for punched card or tape control. The operator simply dials in the desired head movement and radial tool movement for his cut then pushes the start button. When the head reaches the desired position, the tools feed outward toward the dialed-in position and the cut begins. A feed range of 0.015 to 20 ipm is provided. At the end of the cut the machine stops, then the cycle is repeated for the next cut. Dimension dials are located at the headtsock and travel with it; motion controls are located at the headstock, also at the outboard support and on a pendant.

To simplify setup, the turbine casing is supported on parallels which can be floated on air plates. This allows the operator to position the casing and the parallels accurately, without using a crane.

14 steps TO DESIGN A DIE

STEP 11

How to Apply Fasteners

Part I—Socket capscrews

By J R PAQUIN, supervisor,
Tool Engineering Dept.,
Cleveland Engineering Institute

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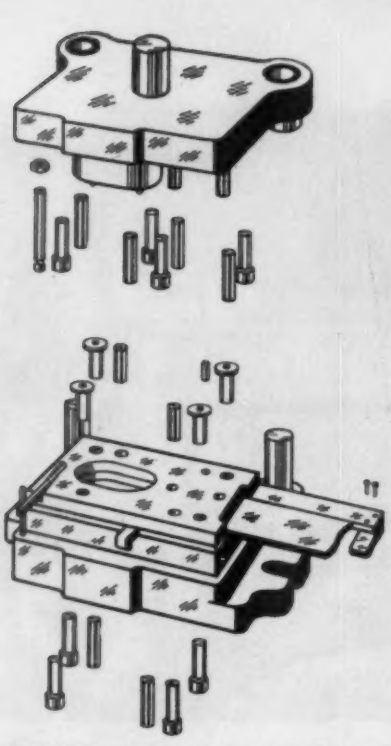
Fasteners are often the "weakest link" in the tool. In applying them, an experienced designer seemingly follows no rules for size, location, or number. But if two designers were to select and apply fasteners for the same job, their choices would be almost identical. And the checker would approve their selections.

Obviously, these men have developed a sense of proportion. When a designer looks over a layout and "feels" that screws are too small, or too close together, or too close to edges, he is subconsciously being guided by observations of tool components that failed and had the same proportions.

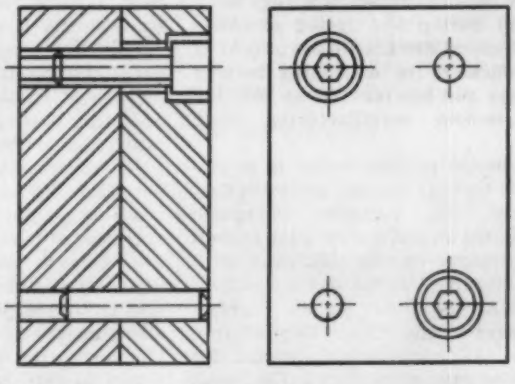
Fortunately, definite rules for application of fasteners can be used by the inexperienced designer or student to avoid many pitfalls. These include hardening breaks and cracks, stripped threads, distortion by release of internal stresses, and misalignment of holes. By the use of these rules, the less experienced man can avoid trouble and quickly develop a correct sense of proportion.

This part I of Step 11 is primarily concerned with application of socket capscrews. Most of the discussion of other threaded fasteners and dowels is left for a later installment.

Note: Step 10, part 2, entitled, "Knockouts" was published in the June 17, 1957 issue, page 138.

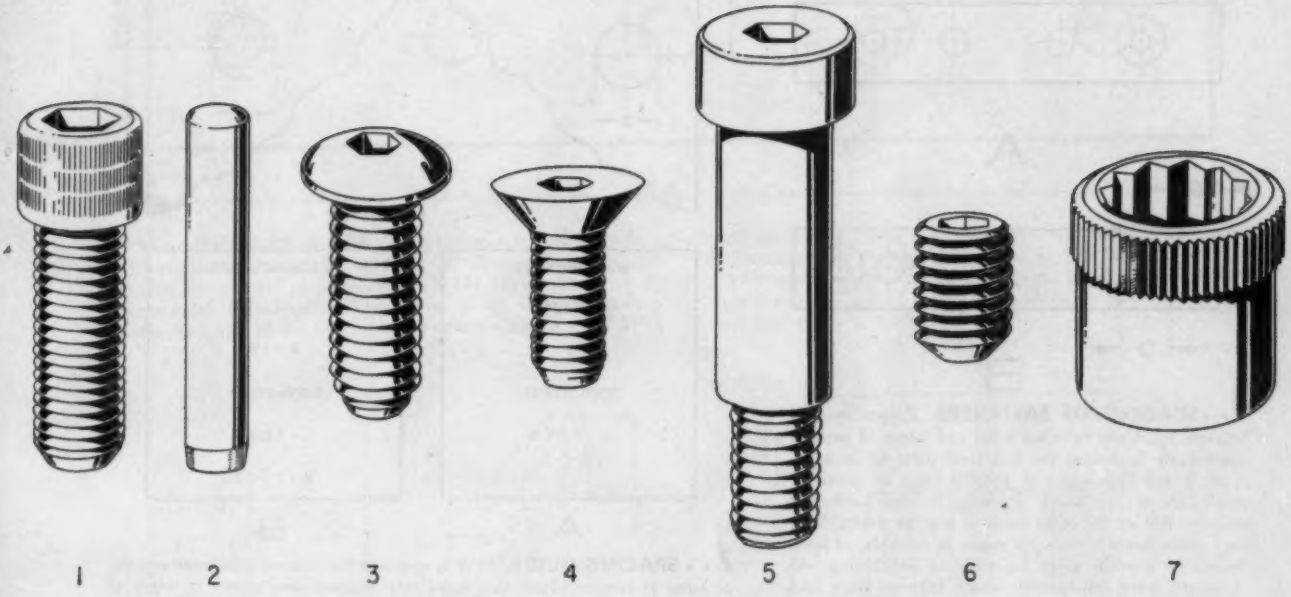


1 . . DIE FASTENERS. In this exploded view of a typical die for producing blanks from metal strip, all fasteners have been shown removed from the components which they locate and hold. From this drawing, it is apparent that fasteners, although small individually, do form a substantial portion of the tool.



3 . . THREADED FASTENERS. When components of any mechanical device must be assembled securely, but must be dismantled occasionally for repair, adjustment or replacement, threaded fasteners are most effective. Socket capscrews are most often used in tool work, followed by dowels.

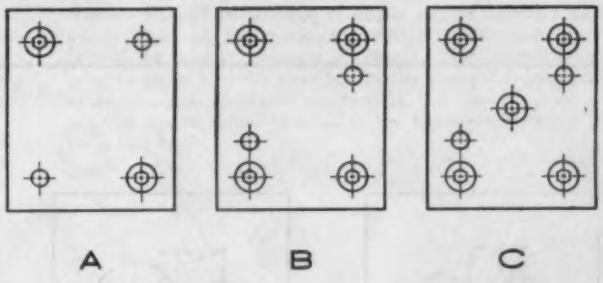
Fundamental rules govern application of screws and dowels: Screws are used only to hold components together. They are not intended to locate components sideways relative to each other. See illustration. Two blocks are fastened with two screws and two dowels. Clearance holes for screws are drilled 1/64 in. larger in diameter than body OD, and counterbored holes for the screw heads are 1/32 in. larger. Obviously, these clearances will allow side shift if the screws are loosened. This is exactly what can happen if a tool is taken apart for sharpening or repair. In precision jigs, fixtures, and dies, side shift of even a few thousandths can cause serious damage. For this reason, closely fitted pins, called dowels, are applied to effect accurate relative positioning. Dowels permit no movement between parts. They can be pressed out for repair, then replaced to restore relative positioning to original accuracy.



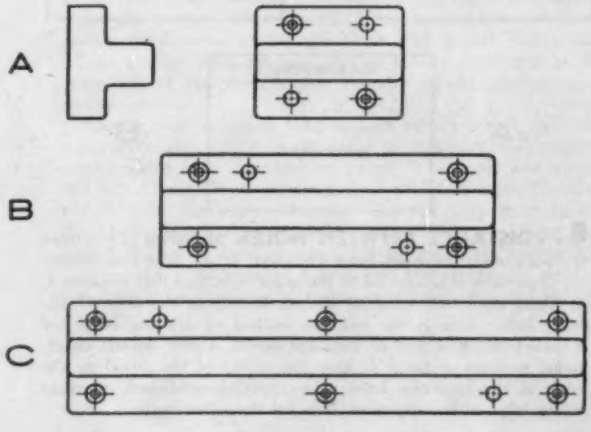
2. . TYPES OF FASTENERS. The types of fasteners most commonly used in die construction are: (1) socket capscrews, (2) dowels, (3) socket button-head screws, (4) socket flat-head screws, (5) stripper bolts, (6) socket setscrews, (7) Allenuts.

Less frequently employed types include: hexagon nuts, washers, studs, rivets, and wood screws.

4. . HOW TO APPLY FASTENERS. In the first method, *A*, screws are applied at two diagonal corners and dowels at the other two corners. This method is employed for small and medium-size blocks designed to withstand only low and medium pressures. For larger blocks and where heavier pressures are encountered, the method shown at *B* should be selected. Screws are applied at all four corners and dowels are offset. When still greater pressures are present, a fifth screw is applied to the center of the block, as shown at *C*.

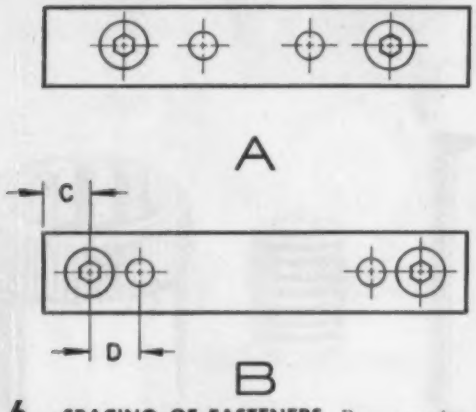


5. . FLANGED PUNCHES. When parts have a projection along the center, as in flanged forming punches, two screws and two dowels are applied at opposite corners when punches are short as at *A*. For longer punches, four screws are applied at the corners, and dowels are offset as shown at *B*. Long punches day be fastened with six screws *C*, applied three to each side. Dowels provide lateral location and they are applied in the same manner as in the punch at *B*.

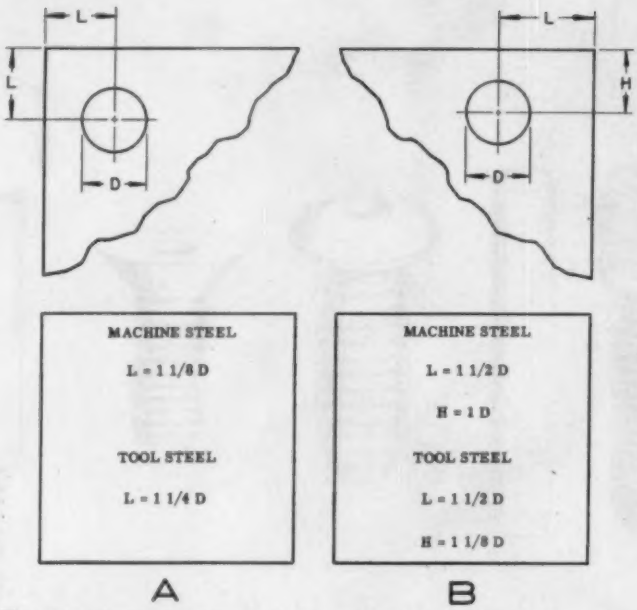


14 steps TO DESIGN A DIE

How to Apply Fasteners—Part I . . .

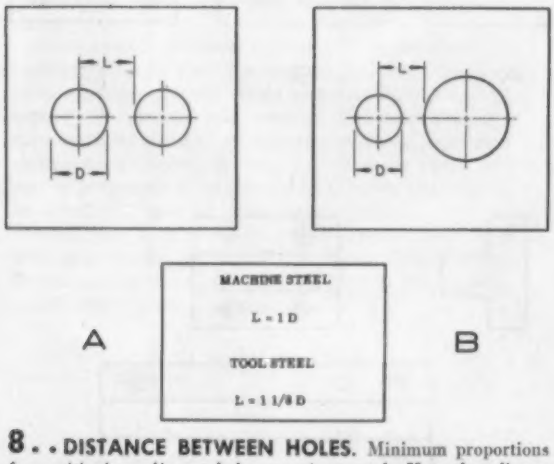


6 . . SPACING OF FASTENERS. Proper spacing between holes and between holes and edges of parts is particularly important for tool steel parts to be hardened. If too little space is allowed there is a strong possibility of the block cracking in the hardening process. But on the other hand, it is often desirable to have screw holes as close to edges as possible, to keep dowels far enough apart for accurate positioning. At *A*, screws have considerable space between them and outside edges. Also, dowels have adequate space between them and their nearest screw holes. Unfortunately, the dowels are too close together for effective positioning of the component. Block *B* shows screws and dowels positioned properly. Space between dowels has been increased considerably. We need to know the safe minimum distances *C* and *D*.

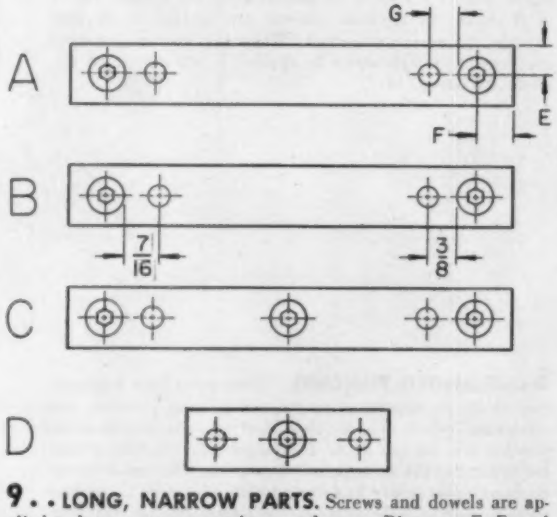


7 . . SPACING GUIDE. At *A* is specified the correct minimum spacing of holes at corners. Note that holes may be positioned closer to edges of machine-steel parts than for parts to be made of tool steel. The extra material applied for tool steel components assures that corners will not crack in the hardening process, if it is properly done.

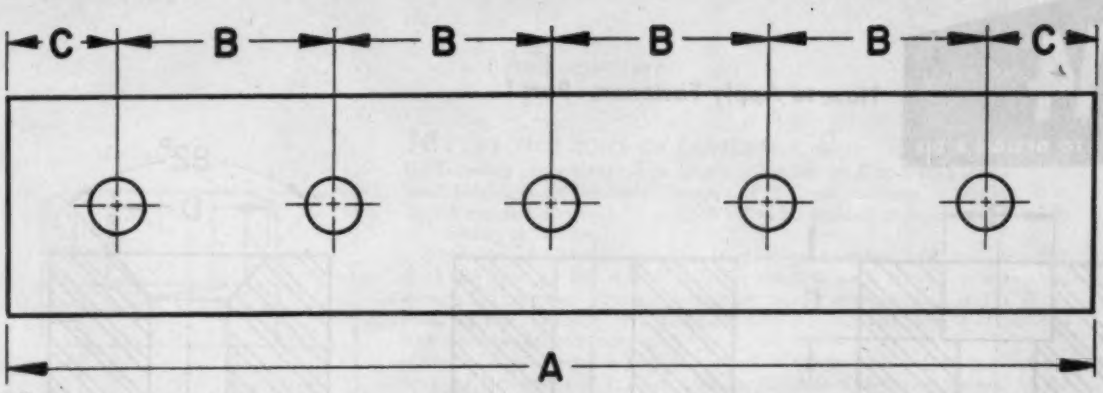
When a hole in tool steel or machine steel is located a greater distance from one edge than in the previous example, it may be positioned closer to the adjacent edge, as shown at *B*. This condition occurs frequently in the application of screw holes in die blocks and in other tool-steel parts.



8 . . DISTANCE BETWEEN HOLES. Minimum proportions for positioning adjacent holes are given at *A*. Note that diameter *D* on view *B* is applied to the small hole, and that distance *L* is taken from the center of the small hole to the edge of the large hole. This is the common method of drawing holes for a socket capscrew and its adjacent dowel. Under normal conditions, measure distance *L* from the center of the dowel to the edge of the capscrew head. For crowded conditions, measure to the edge of the clearance hole for the screw body.

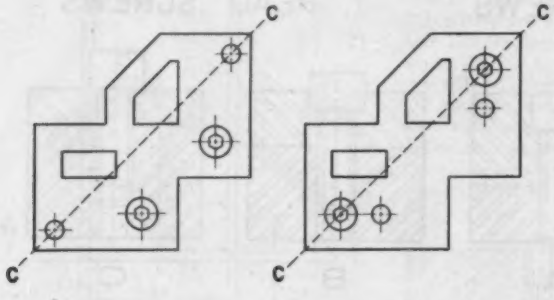


9 . . LONG, NARROW PARTS. Screws and dowels are applied to long, narrow parts in several ways. Distances *E*, *F*, and *G* are given in Figs. 7 and 8. Components to be taken apart for repairs are foolproofed by offsetting one of the dowels as at *B*. When more severe pressures are present, a third screw is applied in the center as at *C*. However, this addition does not affect dowel positions. Short, narrow plates may be fastened with a single screw applied at the center. Dowels at each side provide accurate lateral location.



10. . HOLES IN A BAR In applying a row of holes to a bar, employ the following procedure: (1) Measure length *A*, (2) Decide the number of holes required, (3) Divide length *A* by the number of holes, (4) The answer is the distance between holes. One-half of the amount is the distance between end holes and part edges. Thus, hole locations are properly proportioned.

Example: (1) Five holes are required, (2) Length *A* is 20 in., (3) Twenty divided by 5 is 4. Distance between holes is therefore 4 in. One-half of four is two. Distance between end holes and part edges is therefore 2 in.

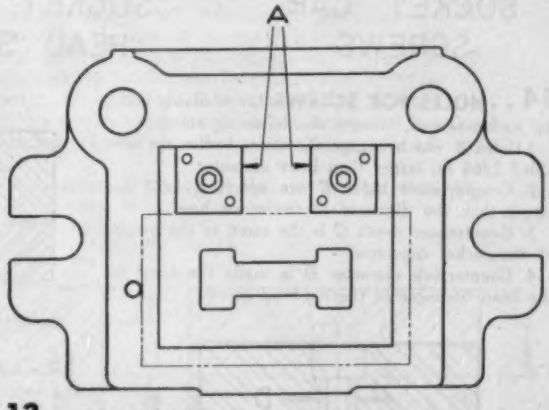


A B

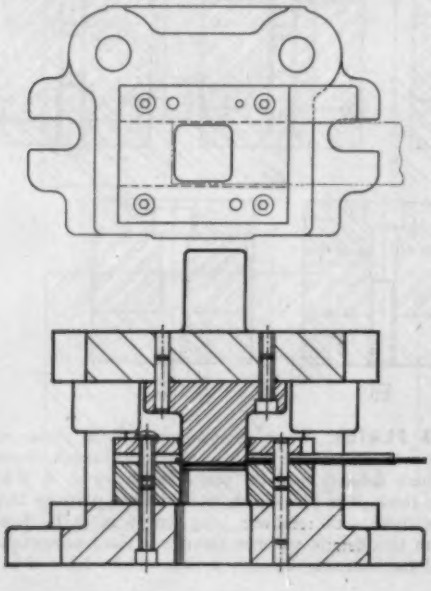
11. . PRESSURE ON SCREWS. In deciding the number of screws required, consider the size of the details in addition to any pressures that will act upon the screws. The component being fastened must be pulled down evenly and squarely. Observe these rules:

1. Keep dowels as far apart as possible.
2. Make sure that the screws hold down the part securely flat.

In this segment of a sectional die, the construction at *A* is incorrect because screws should act somewhere along line C-C for stability. Shown at *B* is the correct application.



12. . FOOLPROOFING. A simple way to foolproof parts which might be reassembled incorrectly in die repair is to reverse the relative positions of dowels. This method is applied to gages *A* in this piercing die. Obviously, it is impossible to reverse gage positions accidentally, nor can they be assembled upside down, because of the holes counterbored for the screw heads.

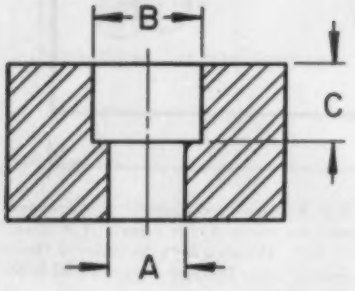


13. . SCREWS ON DRAWINGS. This is the way screws appear in the plan and front section views of a representative die. Observe that in the flange of the punch a dowel is drawn at one side and a socket capscrew at the other. The die block is fastened to the die set with long socket capscrews applied from the bottom. The stripper plate, back gage and front spacer are fastened to the die block with socket button-head screws applied from the top. Double dowels illustrated at the other side of the view provide accurate lateral positioning of components.

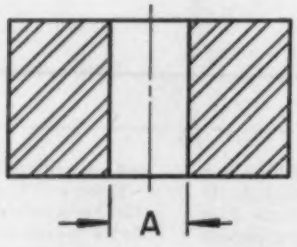
Observe that stripping load against screws which hold the stripper to the die block is equal to stripping load against screws which hold the blanking punch. When only two screws and two dowels are employed to hold and locate the blanking punch, make the screws larger in diameter than those in the die block, where a minimum of four screws are always employed. Compare holding strengths as given in a manufacturer's catalog. In general, screws one size larger, by eighths, will have to be employed to realize approximately equal holding strength.

14 steps TO DESIGN A DIE

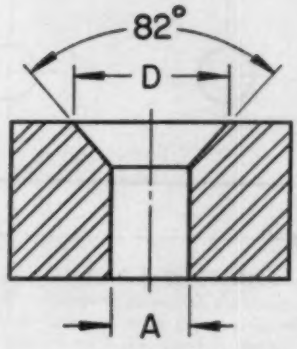
How to Apply Fasteners—Part I . . .



SOCKET CAP SCREWS



SOCKET BUTTON HEAD SCREWS



SOCKET FLAT HEAD SCREWS

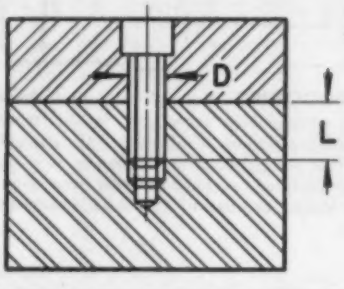
14. . HOLES FOR SCREWS. In specifying holes for socket screws, observe the following rules:

1. Holes *A* which engage the screw bodies are specified 1/64 in. larger than body diameter.

2. Counterbored holes *B* are specified 1/32 in. larger than the diameter of the screw head.

3. Counterbore depth *C* is the same as the height of the socket capscrew.

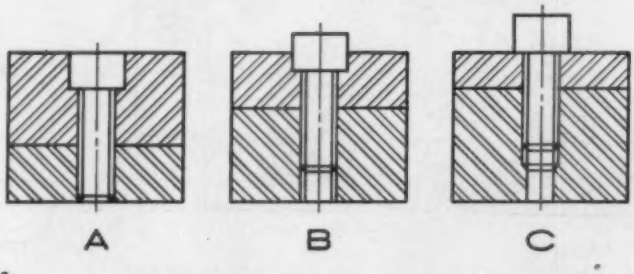
4. Countersink diameter *D* is made the same as the head diameter of the flat-head screw.



Steel	L = 1 1/2 D
Cast Iron	L = 2 D
Magnesium	L = 2 1/4 D
Aluminum	L = 2 1/2 D
Fiber & Plastics	L = 3 D & UP

15. . MINIMUM THREAD ENGAGEMENT. Minimum thread engagement for socket-head screws varies with the material.

Simple formulas establish thread lengths. Let *L* equal screw length, *l* equal thread length, *D* equal screw diameter. For National Coarse (NC) threads, *l* equals 2D plus ½ in. where this length of thread would be greater than one-half the screw length. And *l* equals ½ *L* where this length of thread would be greater than 2D plus ½ in. For National Fine (NF) threads, *l* equals 1½ *D* plus ½ in. where this length of thread would be greater than ⅝ *L*. And *l* equals ⅝ *L* where this length of thread would be greater than 1½ *D* plus ½ in. Screws too short to allow application of these formulas are threaded as close to the head as possible.

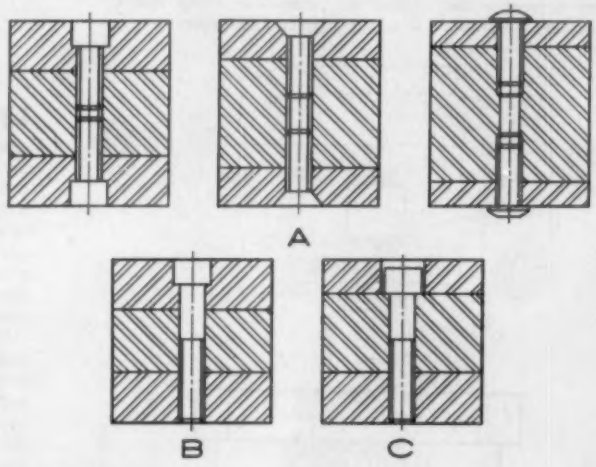


16. . APPLICATION OF SCREWS. There are three methods of applying socket capscrews:

1. The most commonly used method is to counterbore the hole for the screw as at *A*. The screw head engages this counterbored hole and its top comes flush with the surface after assembly.

2. In a variation of the foregoing, the hole is not counterbored to full depth, and the head protrudes a certain amount as at *B*. This is employed for fastening thinner plates.

3. In the third method, the hole is simply drilled and the screw head is left to protrude as at *C*. This would be used for thin parts and in covered places.



17. . FASTENING PLATES. When components such as plates are fastened to both sides of a block, tap the block all the way through. Screws engage the block from both sides to hold the plates, as shown at *A*. When the center block is not too thick, it is permissible to hold three parts by threading one and fastening the three with relatively long screws as at *B*. Sometimes it is desirable to fasten two details together through a third component. The screw head is reached for fastening through a hole which clears it as at *C*.

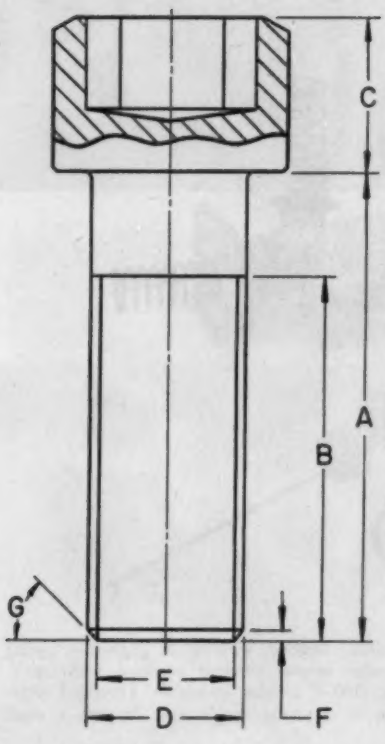
18. . PROPORTIONS OF CAPSCREWS. Socket capscrews are drawn to the following proportions: A = length of the screw; B = thread length; C = head height, D = the body diameter, E = root diameter of thread; F = thread chamfer, drawn 1/32 to 3/32 in. wide, depending on size; G = angle of chamfer, or 45 deg.

When the block to be fastened is made of hardened tool steel, distance H should never be less than 1½ D. For machine steel, it need only be thick enough for adequate strength. Length of thread engagement I is 1½ D for steel, with a minimum of 1 D under certain conditions, and 2 D for cast iron and non-ferrous metals.

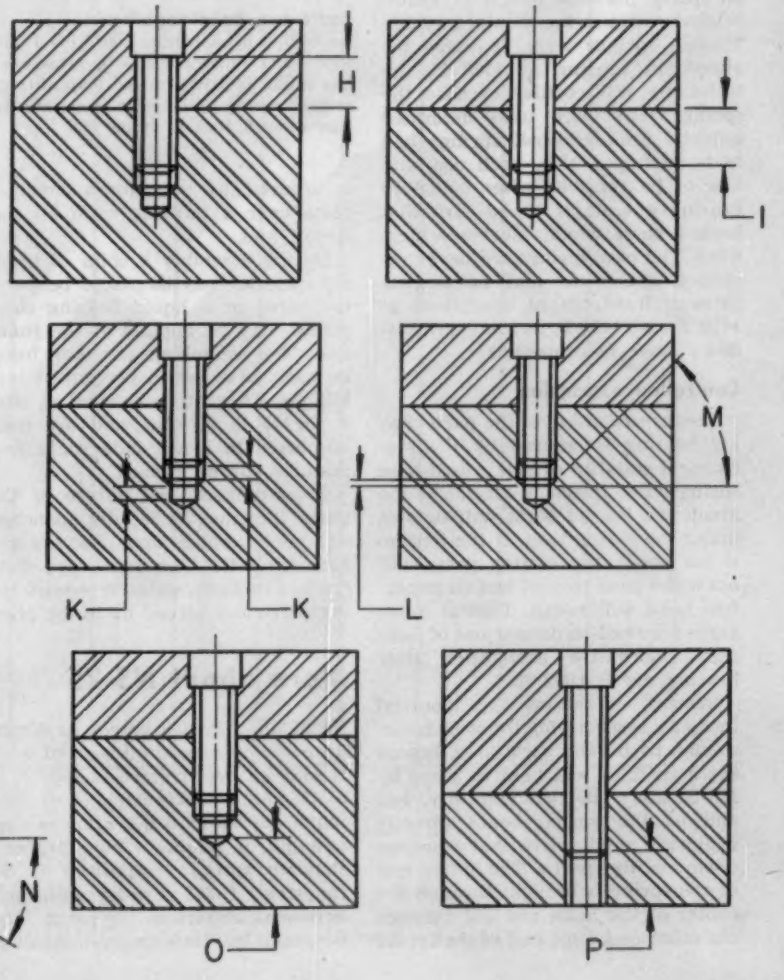
Depth of the tapped hole J is applied in increments of 1/16 in. at least, never in increments of 1/32 or 1/64 in. Distance K between the end of the screw and the bottom of the thread and between the bottom of the thread and the bottom of the tap drill hole is normally made ⅛ in. Bottoming taps have from 1 to 1½ imperfect threads, and this fact must be taken into consideration when drawing blind holes. The thread must extend at least 1.5 times the pitch of the thread past the end of the screw. Length L of the thread chamfer is made 1/16 in. Chamfer M is 45°. At the bottom of the tap-drill hole are drawn two lines at angles of 30°, dimension N. They represent the conical depression produced by the end of the tap drill.

For hardened tool steel parts, distance O between the end of the tap drill hole and the lower surface of the block must be greater than 1 D (one diameter of the screw body). When this distance is less than 1 D, show the tap drill running clear through the part. If this is not done, it is possible for the thin, circular section of steel to crack in hardening and fall out as a rough-edged disk.

The hole which a screw engages is tapped all the way through when distance P from the end of the screw to the lower surface of the block is 1 D (one diameter of the screw), or less.



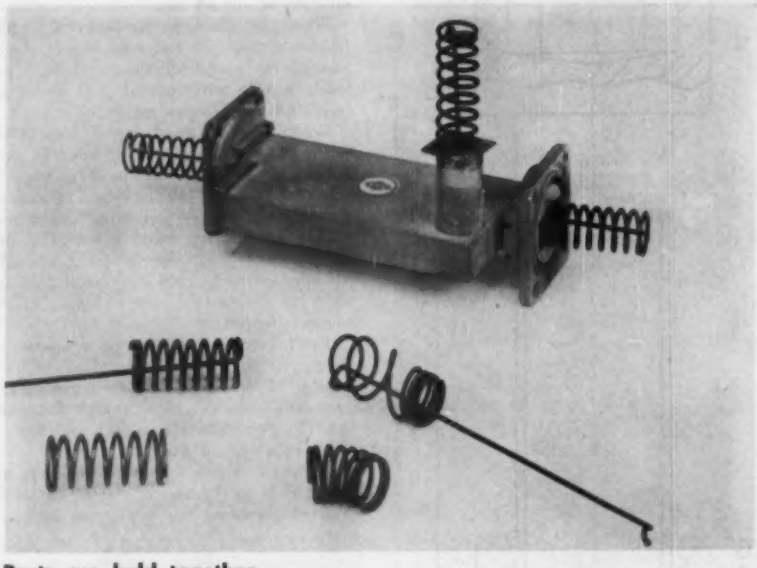
SOCKET HEAD CAP SCREW



Alloy springs take higher brazing heat

Until spring materials would retain tension in brazing baths up to 1400 F, NRK Manufacturing and Engineering Co, Chicago, had to use cumbersome weights, intricate fixtures, and laborious tack welding to braze precision brass parts. Producing small-lot custom parts as well as large-run "microwave plumbing," N R K wanted springs to hold components during 1400-F brass brazing as it did at lower-temperature (1100 F) aluminum brazing. NRK was seeking, too, a spring material that would be more durable at all temperatures. The problem was solved by using spring wire made of NS-25 cobalt base alloy furnished by National-Standard Company, Niles, Michigan.

Spring assembly techniques were impossible for brass brazing, until the new springs were tried, because no spring material available would retain tension at the required 1400 F. Though springs were available for aluminum brazing at 1100 F, the technique was costlier because the springs that were used deformed quickly. Stainless-steel springs had to be reshaped after each use, and had to be replaced after 60 or 70 brazing operations to be sure that brazed parts would meet specifications. The new springs are never reshaped after use and have gone through hundreds of operations at 1100 F and 1400 F without any visible change in properties.



Parts are held together . . . for 1400 F brass brazing, and 1100 F aluminum brazing, with NS-25 superalloy spring wire (left) which remains "good as new" after several hundred brazings, while stainless spring is deformed and limp after one 1100 F brazing operation. Threaded collar is held against rectangular waveguide tube by applying spring and slipping a small wire through hook in spring end

Controlled expansion

Proper expansion of the parts during heating is assured by the mechanical stability of this cobalt-base spring wire. If spring tension is too great, the brazed parts will deform under the spring load. If the tension is too small, the mating parts will not make good contact and an imperfect bond will result. Typical tolerances required on dimensions of complex microwave assemblies after brazing are ±0.002 in.

Brazing operations are identical in many respects for brass and aluminum parts. The parts to be brazed are assembled and held in place by NS-25 alloy springs. Typically, one end of the spring bears directly against a small plate that squeezes down on the parts. The other end of the spring is brought through the center of the helix and out through the other end. This end of the spring is secured by slipping a notched plate over a bulbous knob on the spring end.

During assembly a shim of brazing material may be placed between the parts, or a liquid brazing compound may be applied at the junction. The assemblies are then hung on hangers or set in perforated tote baskets. They are preheated at 1000 F for 15 to 30 min. and are then immersed in a salt bath for a few minutes, to be brazed.

Depending on the nature of the parts, they may be rapidly quenched or slowly cooled upon leaving the brazing bath. The parts are then washed in warm water to remove the corrosive flux picked up in the brazing bath. The springs are removed after washing and returned to the assembly bench for reuse without any further re-coiling or processing.

Cost savings resulting from use of the new springs vary considerably, depending on the length of run for a given part and the complexity of the assembly. But NRK has standardized on these springs for all jobs where spring fixturing is used, from the longest production runs to the pilot runs or orders for single units.

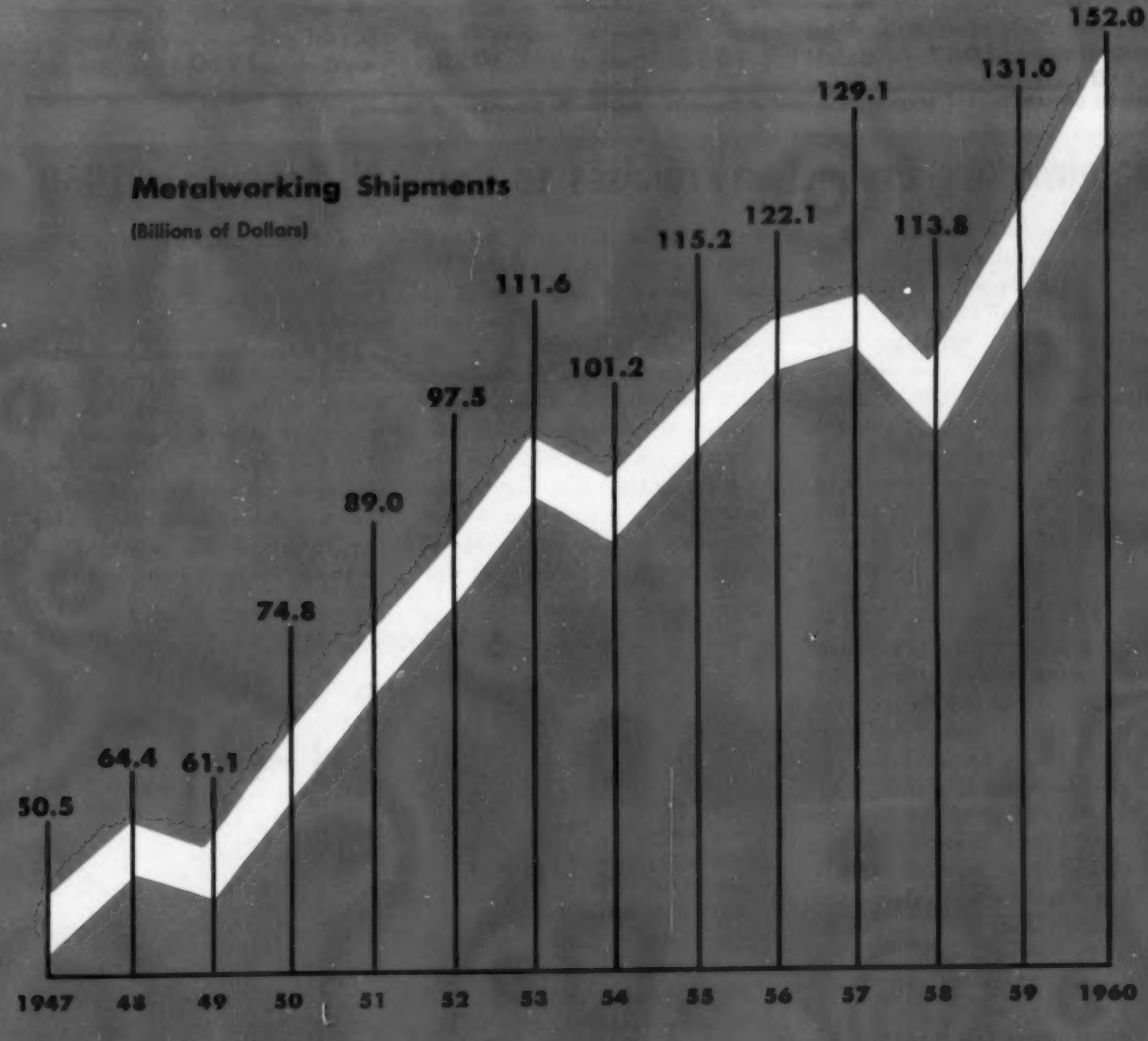
A variety of spring sizes and shapes have been designed by NRK from which the proper springs are selected for each of the many hundreds of brazing operations with which they are confronted.

More about NS-25

NS-25 alloy is also known as Haynes 25 (L-605). It is one of the group of heat-treatable superalloys and contains 52% cobalt and 15% tungsten. It is solution heat treated at 2200 F for 0.16 hr. L-605 has a Brinell hardness of 256 and a tensile strength of 155,000 psi at 70 F; 75,000 psi at 1200 F. The important value of this alloy as a spring material is that, while it loses some strength, it retains a high degree of springing stability at 1400 F. (Also showing spring possibilities is S-816, which contains molybdenum and tungsten.) L-605 is not usually given age-hardening treatment, but it will harden in service in the range 1300 to 1800 F.) Details on these alloys can be found in "How to work non-ferrous metals," AM, Mid-November, 1955.

1960

BIGGEST YEAR EVER



American Machinist / Metalworking Manufacturing Special Report No. 483 • February 8, 1960

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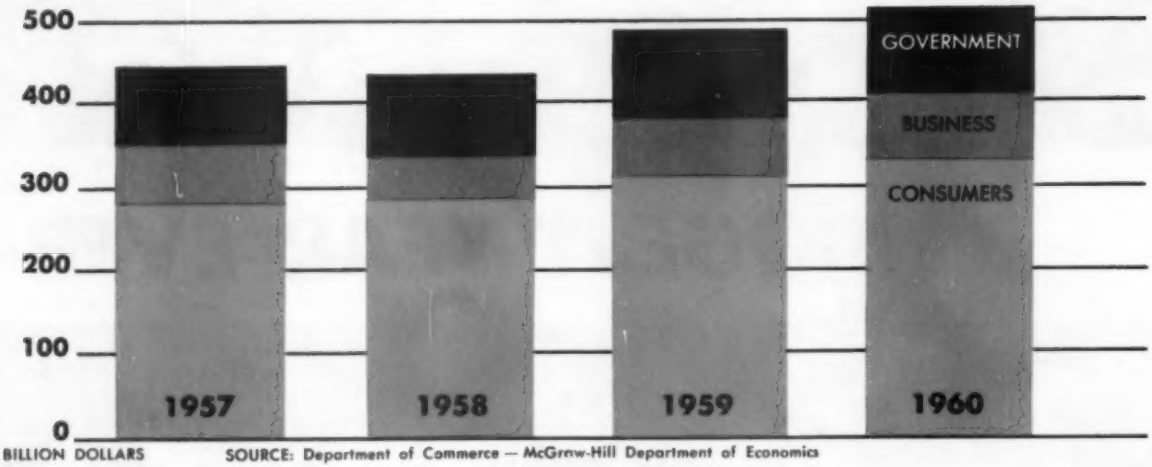
GROSS NATIONAL PRODUCT TO HIT NEW HIGH



SOURCE: Department of Commerce — McGraw-Hill Department of Economics

Metalworking Production Promises to Break All Records in 1960

The metalworking industry will do the biggest business in its history this year. In dollar terms, production of metal goods of all kinds promises to add up to $150 billion. That represents a gain of 16% over estimated shipments of $130 billion during 1959. In physical volume, output is likely to average around 200 on American Machinist's Production Index, which takes 1947-1949 as 100. The 1959 average was 178.

This remarkable performance will be on top of an outstanding year in 1959. Even the dampening influence of the steel strike did not prevent metalworking production from scoring a gain of 15% over the recession-recovery year of 1958. Total industrial production for the nation, by contrast, increased only 11%.

But the steel strike did have the effect of holding down manufacture of metal products, especially automobiles, late in the year. It resulted in a substantial volume of production being postponed until early this year, thus helping to insure that 1960 will be a record-breaker.

Capital goods manufacturers will do well this year. Spending for new plant and equipment is headed toward the all-time high of 1957, according to the latest survey by the McGraw-Hill Department of Economics. Upward revisions of already liberal appropriations are expected. The heavy spending will be induced by 1) the development of many new products which require either new manufacturing facilities or retooling of existing production lines, and 2) the need for lowering costs to get higher productivity at today's high labor rates. The outlays for new equipment will greatly benefit capital goods producers and make 1960 a good year for them. Their backlogs have been going up fairly rapidly since the summer of 1959.

The automobile industry probably will have the second best year in its history, surpassed only in 1955. Passenger car assemblies are projected at 6.7 to 7 million, plus imports. Total output of cars and trucks should be close to 8 million units. New production records should be set by car makers in the early months of 1960.

R&D SPENDING WILL RISE

	1958 ACTUAL	1959 EST.	1962 PLANNED
	MILLION DOLLARS		
R. & D. SPENDING			
Machinery	605.4	653.8	778.0
Electrical Machinery	1,435.6	1,636.6	2,176.7
Aircraft & Parts	3,037.7	3,341.5	3,675.7
Fabricated Metal Products	199.1	215.0	253.7
Prof. & Scientific Inst.	324.5	353.7	435.1
All Other Metalworking	733.0	803.0	962.5
Metalworking Total	6,335.3	7,003.6	8,281.7
All Other Manufacturing	1,482.2	1,596.8	1,895.9
All Non-Manufacturing	363.3	399.6	431.6
Total	8,180.8	9,050.0	10,609.2

SOURCE: McGraw-Hill Economics Department

The industry will be pushing hard to restock dealers in time for the big spring and summer selling seasons.

Sales of appliances, radios and TV sets will be higher this year, but probably will not gain as much as in 1959 compared with 1958, because of a decline in housing starts. Public and private housing starts are expected to drop from 1.4 million to 1.2 million units, which still will make 1960 a big year.

Makers of heavy electrical apparatus anticipate a 7% increase in the physical volume of shipments this year. In fact, they will hit a new high and will be operating once again at close to 90% of capacity. Output the past year showed a healthy hike of 13% with sizable expansion in transmission and distribution equipment that served to offset a decline in generating equipment.

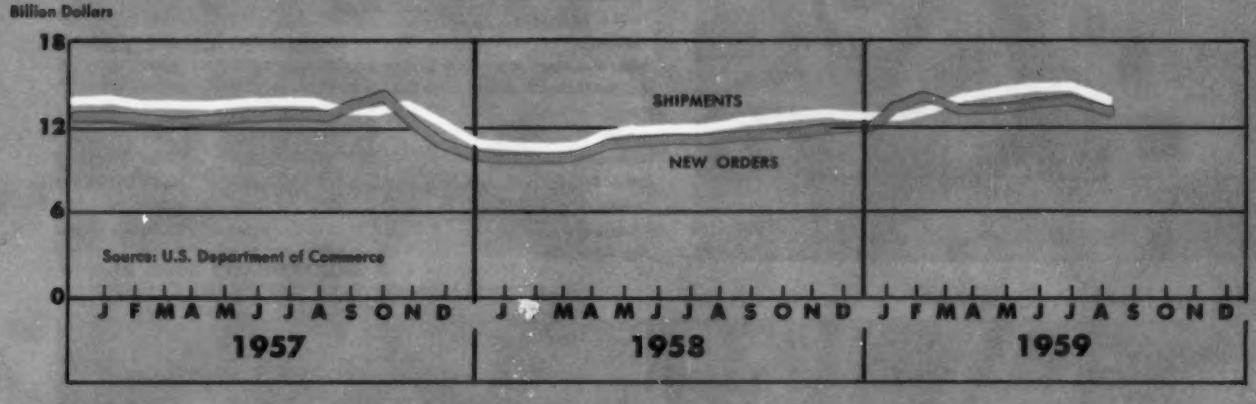
Farm equipment demand will be down. Declining per capita farm income last year and this year will result in a cutback in farmers' purchases. However, farmers bought much larger quantities of machinery the past year than in 1958, even though their incomes were shrinking. Despite the modified optimism as to 1960 sales, farm equipment makers probably will produce 10% more units this year than last to build up dealers' stocks.

Railroad equipment builders expect an increase of 11% in unit volume of shipments in 1960. There is a good possibility that as general business surges ahead this year and railroad profits move up, railroads will start placing a heavy volume of orders for equipment. Freight car production the past year totaled around 45,000 units.

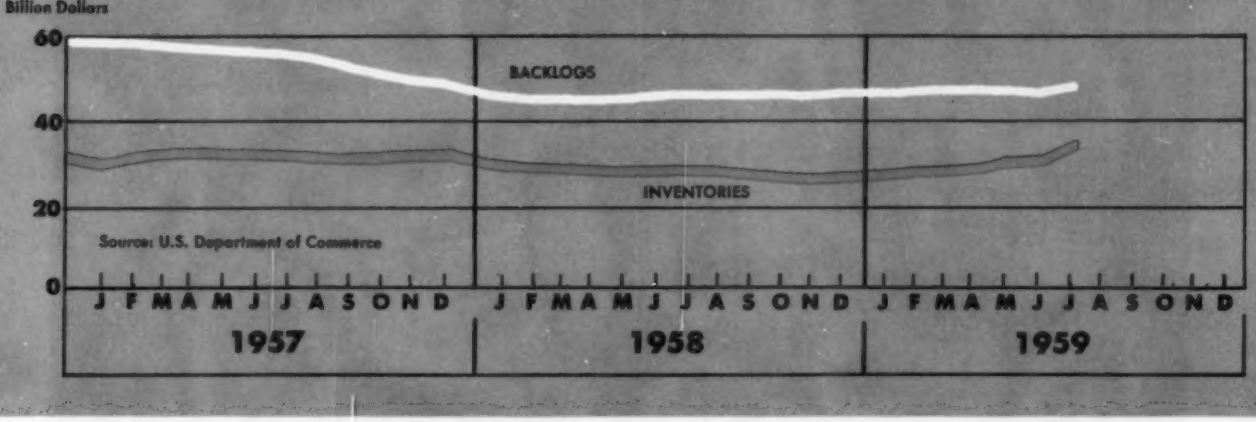
Office machinery people, who chalked up a 12% increase in business the past year, are looking for a similar gain this year. All types of office equipment, from typewriters to big data processing and analyzing machines, are doing well. Makers of instruments and controls are in the same growth trend as office machine companies. Their dollar volume in the year ahead should top $4.3 billion, compared with $4 billion in 1959.

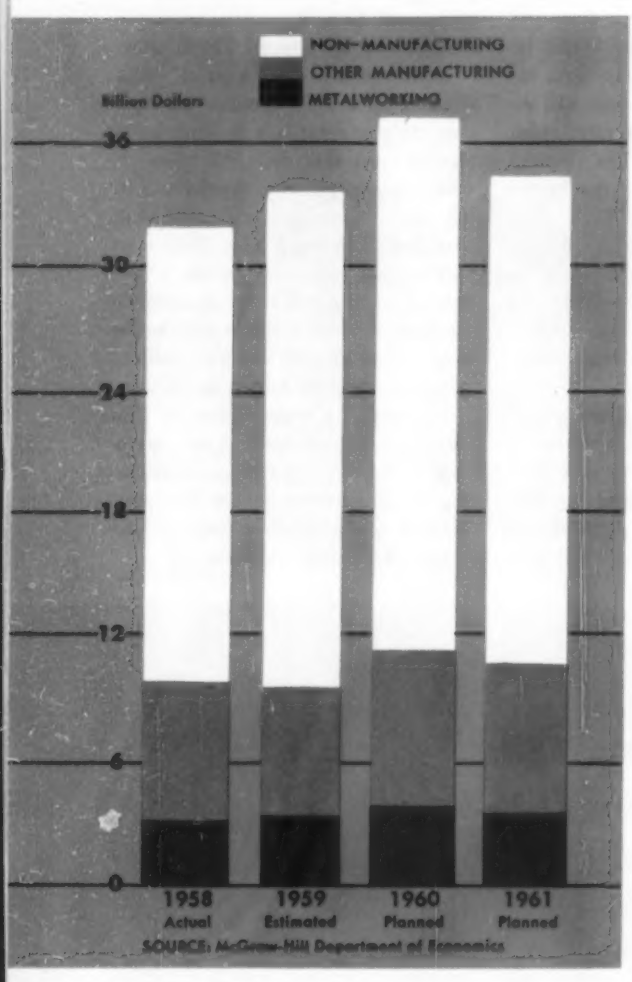
Makers of a wide variety of fabricated metal products, from stampings to heating apparatus, are counting on an increase of 6% this year. Manufacturers of boiler shop products expect the biggest increase.

Durable Goods Orders & Shipments



Backlogs & Inventories of Durable Goods





Outlay for New Plant and Equipment to Rise

NEW PLANT & EQUIPMENT SPENDING

(Billions of Dollars)

	Actual 1958	Est. 1959	Planned 1960	Planned 1961
Iron and Steel	1,217	1,180	1,670	1,169
Nonferrous Metal	510	428	357	350
Machinery	915	986	1,161	1,129
Electrical Machinery	459	532	582	559
Autos, Trucks & Parts	558	709	841	791
Transportation Equipment	370	440	399	359
Other Metalworking	723	880	875	844
Chemicals	1,320	1,188	1,473	1,502
Paper and Pulp	578	613	828	704
Rubber	134	178	233	247
Stone, Clay & Glass	399	542	603	594
Petroleum Refining	665	692	754	814
Food & Beverages	742	794	783	737
Textiles	288	343	361	350
Misc. Manufacturing	883	1,061	1,037	1,022
ALL MANUFACTURING	9,761	10,025	11,957	11,171
Petroleum Industry	4,819	5,220	5,154	5,077
Mining	394	415	395	294
Railroads	754	822	904	1,012
Other Transp. & Commun.	3,899	4,362	4,992	4,491
Utilities	6,088	5,876	6,066	5,768
Commercial	7,041	7,886	8,596	7,564
ALL BUSINESS	32,091	33,914	37,310	34,566

WHERE METALWORKING IS INVESTING ITS MONEY IN PLANT AND EQUIPMENT

	NORTH CENTRAL		SOUTH		WEST		NORTHEAST		MIDDLE ATLANTIC		SOUTH ATLANTIC	
	ACTUAL 1958	PLAN 1959	ACTUAL 1958	PLAN 1959	ACTUAL 1958	PLAN 1959	ACTUAL 1958	PLAN 1959	ACTUAL 1958	PLAN 1959	ACTUAL 1958	PLAN 1959
Machinery	59%	58%	4%	3%	4%	7%	13%	10%	18%	20%	2%	2%
Electrical Machinery	53	36	4	13	2	2	10	9	19	28	12	12
Autos	72	78	2	1	9	11	1	1	11	6	5	3
Trans. Equip.	16	14	16	18	27	36	24	14	5	8	12	10
Other Metalworking	38	47	12	11	5	3	11	11	29	22	5	6
Metalworking Total	50	50	7	8	8	10	11	9	18	17	6	6

SOURCE: McGraw-Hill Economics Department

FORECAST: New Orders for Machinery

(Quarterly Adjusted, 1950 = 100)

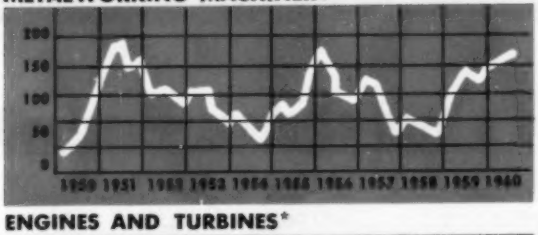
TOTAL MACHINERY (except electrical)

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	67	149	96	100	82	102	140	149	122	168	172*
2 Qtr.	79	132	101	107	87	118	149	143	134	177	182*
3 Qtr.	137	119	103	100	92	134	159	156	158	178	193*
4 Qtr.	124	117	94	88	100	143	141	122	144	164*	

CONSTRUCTION AND MINING MACHINERY*

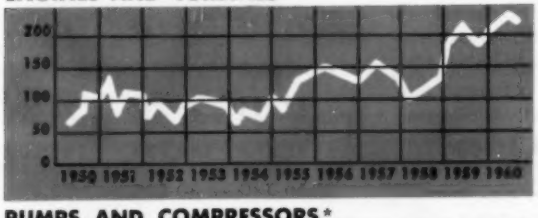
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	82	194	124	111	87	139	166	174	142	196	225*
2 Qtr.	86	148	115	113	95	131	172	151	183	215	236*
3 Qtr.	114	106	88	80	90	134	159	152	156	193	227*
4 Qtr.	118	101	91	74	112	155	166	127	157	190*	

METALWORKING MACHINERY*



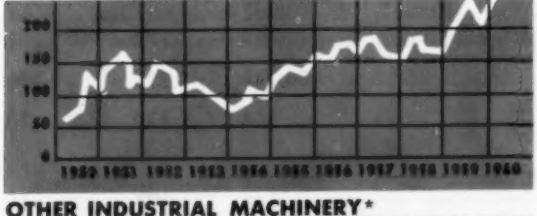
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	49	235	150	145	103	134	219	166	87	150	199*
2 Qtr.	63	248	151	147	96	123	168	161	79	190	212*
3 Qtr.	129	206	150	108	84	140	152	130	96	172	201*
4 Qtr.	159	204	134	100	102	222	150	87	116	184*	

ENGINES AND TURBINES*



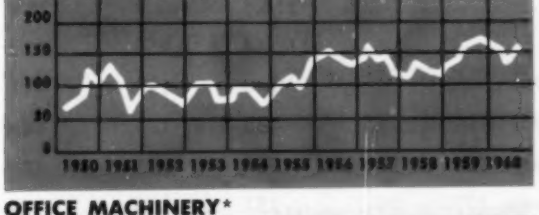
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	68	153	98	99	81	106	166	145	108	197	217*
2 Qtr.	81	109	106	102	92	128	148	149	107	208	233*
3 Qtr.	130	121	81	94	84	143	148	149	137	182	227*
4 Qtr.	121	109	92	91	106	143	140	157	145	199*	

PUMPS AND COMPRESSORS*



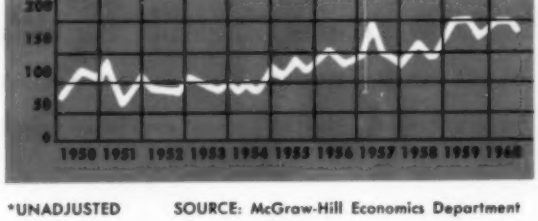
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	69	150	127	118	98	132	156	189	189	233	258*
2 Qtr.	80	178	156	120	107	145	185	190	169	252	277*
3 Qtr.	131	128	118	106	105	141	186	156	175	207	271*
4 Qtr.	120	135	117	92	114	154	183	152	179	234*	

OTHER INDUSTRIAL MACHINERY*



	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	76	147	90	100	92	100	136	144	123	163	150*
2 Qtr.	82	114	86	101	85	112	144	135	135	164	157*
3 Qtr.	123	86	81	81	76	102	129	135	145	143	140*
4 Qtr.	119	101	82	80	87	123	127	121	137	139*	

OFFICE MACHINERY*

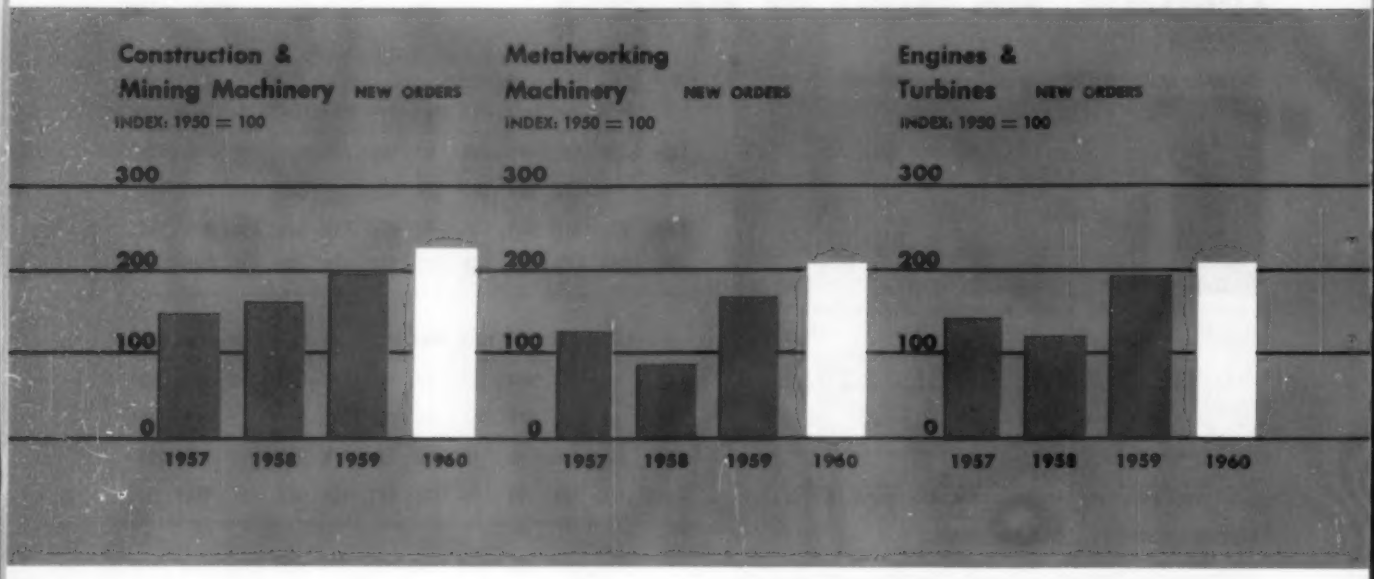


	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Qtr.	76	144	103	107	98	114	138	166	154	196	182*
2 Qtr.	96	115	95	96	107	128	151	193	148	197	186*
3 Qtr.	116	85	88	89	93	118	134	153	162	166	174*
4 Qtr.	113	104	97	107	120	123	145	141	184	172*	

*UNADJUSTED SOURCE: McGraw-Hill Economics Department

*Forecast made in mid-July 1959

1960: BIGGEST YEAR EVER . . .

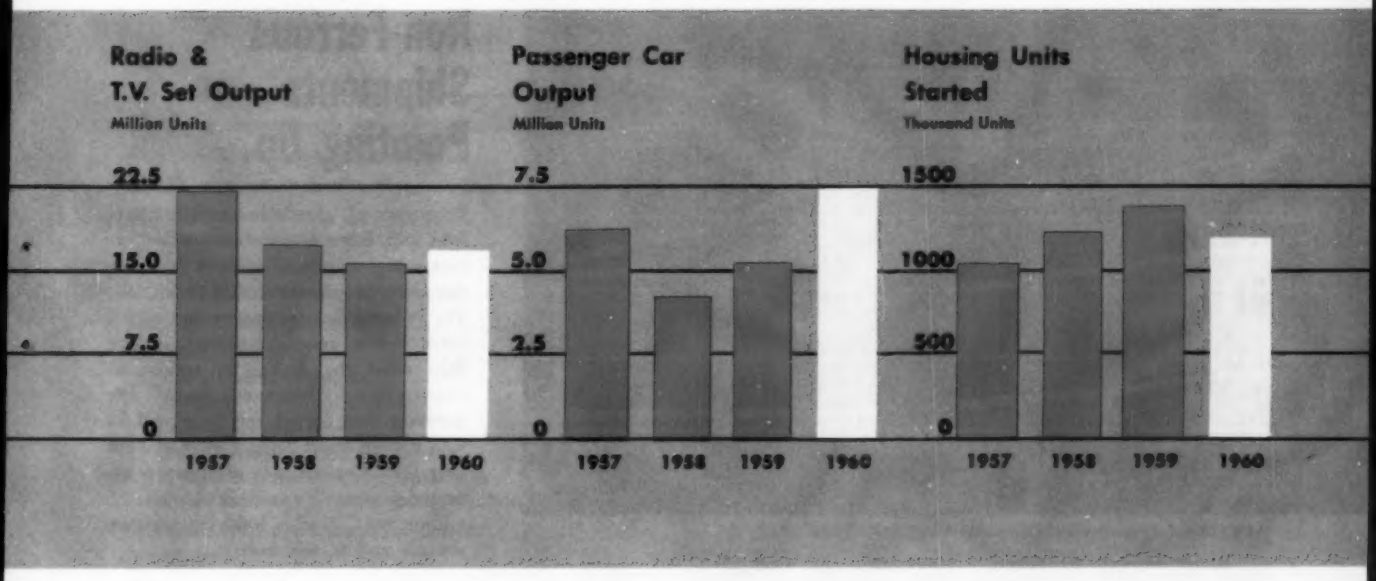


Demand for Industrial Products to Expand

	1957	1958	1959
Trucks (U. S.) units	1,103,343	874,278	1,060,000
Blowers & Fans (new orders in $1000)	196,941	126,531	150,000
Unit Heater Group (new orders in $1000)	85,251	77,742	82,000
Foundry equipment (47-49 = 100)	156.8	107.0	140.0
Pumps (new orders in $1000)	85,825	66,331	72,000
Polyphase induction motors (shipments in $1000)	182,473	144,889	161,000
Direct current motors (shipments in $1000)	38,330	20,511	25,800
Tractors (wheel)	438,916	498,170	555,000
Industrial supplies (new orders index)	199	170	208
Freight cars (units)	100,144	44,282	39,300
Railroad cars — passengers	804	130	25
Materials handling equipment Bookings 1954: 100	124	109	134
Gear shipments (index 1947-49 = 100)	216.5	163.9	238.2
Industrial electric trucks (units)	11,266	8,960	8,550
Engines — Turbines (new orders index 1950 = 100)	144	127	197
Office machinery (new orders index 1950 = 100)	163	163	183
Metalworking machinery (new orders index 1950 = 100)	136	95	174
Const. & Mining machinery (new orders index 1950 = 100)	151	160	199
Industrial fasteners shipments (index 1947-49 = 100)	162	125	145

Source: U. S. Bureau of Labor Statistics, Ward's Automotive Reports, RETMA, American Home Laundry Manufacturers Assn., Vacuum Cleaner Manufacturers Assn., NEMA, Air Conditioning and Refrigeration Institute, U.S. Dept. of Commerce, Facts For Industry.

McGraw-Hill Department of Economics



Consumer goods to have a big year

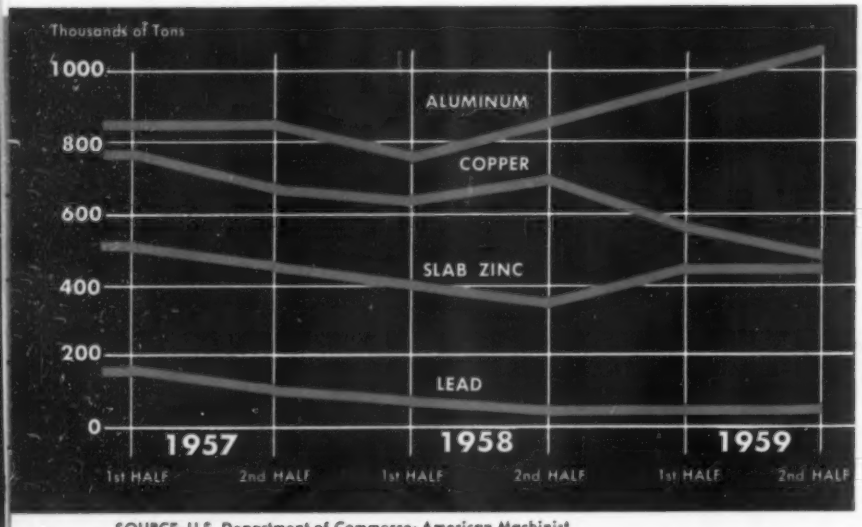
Manufacturers of consumer goods are expected to have a big year in 1960. Buying power is at an all-time high, and people are in the mood to spend. In some industries, companies anticipate that a new peak will be set.

The automobile industry is counting on coming close to setting a new record. The steel settlement removed the final barrier that might prevent car makers from producing upwards of 7 million passenger cars (this figure includes imported as well as domestically-built cars). The introduction of compact cars, with more of them to be put on the market during the course of the year, will give special zip to motor car sales. In 1955 the all-time record was established with passenger car sales of 7.2 million. Because of the delay in production caused by the steel strike, monthly output of cars in some of the months ahead is almost sure to set a new high.

The home appliance industry also is looking ahead to a very prosperous year. 1959 was a good year for most appliance companies. 1960 promises, if anything, to be just a little better. Color TV is one product which should show a gain of close to 50%. TV sets as a whole probably will be up 5 to 10%. And the total volume the past year was around 20% better than during the previous year. Sufficient credit is at hand to finance installment buying so that sales will not be held back, despite the large amount of credit outstanding. Consumer goods will be aided by the high volume of housing starts.

SHIPMENTS	1957	1958	1959
Passenger cars (U. S.)	6,113,344	4,247,000	5,300,000
Television sets	6,399,000	4,920,000	5,800,000
Radios	15,427,774	12,335,362	15,500,000
Washers: standard size	3,791,000	3,692,000	4,200,000
Vacuum cleaners (floor type)	3,190,000	3,200,000	3,400,000
Ranges	1,365,000	1,355,000	1,600,000
Domestic cooking stoves (non-elec.)	1,968,600	1,896,000	2,054,700
Domestic heating stoves (non-elec.)	2,121,462	2,140,452	2,350,000

SHIPMENTS	1957	1958	1959
Oil burners	613,979	577,227	635,000
Warm air furnaces	1,067,191	1,185,631	1,062,000
Non-electric water heaters	2,304,836	2,622,154	3,030,700
Refrigerators	3,350,000	3,117,000	3,750,000
Air conditioners (room)	1,586,000	1,550,000	1,500,000
Freezers	925,000	1,100,000	1,300,000
Civil aircraft	6,745,000	6,414,000	7,000,000
Housing starts	1,041,900	1,209,400	1,380,000



SOURCE: U.S. Department of Commerce; American Machinist

Non-Ferrous Shipments Pointing Up

Producers of aluminum, copper, zinc, lead and other non-ferrous metals expect a higher volume of sales this year than last. Shipments should be up 7%. The industry is counting on the anticipated rise in general business to more than offset the decline in residential construction. Aluminum people are guessing that output this year will be 2.15 million short tons, a gain of 12% over 1959. Consumption of copper is expected to attain a new peak at about 1.5 million tons. Zinc is likely to pick up sharply and so will lead.

METALS PRODUCTION

Net Production — Thousands of Tons

	1957		1958		1959	
	1st HALF	2nd HALF	1st HALF	2nd HALF	1st HALF	2nd HALF
PIG IRON	41,264	37,293	25,453	31,847	42,074	18,000
Basic	34,347	30,784	21,333	26,943	36,833	17,600
Foundry	1,123	1,153	749	873	1,032	400
STEEL INGOTS AND CASTINGS	61,571	51,341	38,311	47,980	62,924	28,000
Open Hearth	54,743	47,584	33,930	42,219	56,562	25,150
Bessemer	1,544	1,030	685	803	1,016	450
Electric	5,284	2,727	3,696	4,958	5,346	2,400
ALLOY STEEL INGOTS	4,783	3,988	2,814	3,205	5,722	N. A.
Carbon Baron	11	7	5	8	20	N. A.
Chromium	670	625	361	604	933	N. A.
Chromium-Molybdenum	507	386	295	379	558	N. A.
Chromium-Vanadium	28	24	19	25	42	N. A.
Manganese	81	93	63	103	138	N. A.
Manganese-Molybdenum	212	193	89	114	233	N. A.
Molybdenum	385	335	203	274	423	N. A.
Nickel	18	14	23	30	28	N. A.
Nickel-Chromium	68	48	37	32	54	N. A.
Nickel-Chromium-Molybdenum	589	487	430	512	841	N. A.
Nickel-Molybdenum	196	137	119	126	230	N. A.
Silico-Manganese	38	40	23	43	50	N. A.
All other	1,408	1,168	812	968	1,551	N. A.
Stainless Steel	572	428	335	464	620	N. A.
REFINED COPPER	759	685	652	701	580	490
LEAD	178	153	140	126	128	128
SLAB ZINC	522	465	410	372	425	425
ALUMINUM	824	824	763	801	942	1,080
CASTINGS						
Steel	749	610	463	394	596	300
Gray Iron	3,665	3,211	2,765	3,099	3,813	2,850
Malleable	289	231	183	201	291	225
Copper and Copper Base Alloy	224	233	176	183	182	205
Zinc and Zinc Base Alloy	226	205	159	193	205	205
Aluminum and Aluminum Base Alloy	310	251	210	217	242	250
COMMERCIAL STEEL FORGINGS	831	665	540	722	772	515

SOURCE: American Iron and Steel Institute; U.S. Dept. of Commerce; Facts for Industry; American Machinist

WHERE STEEL IS USED	1958 tons	1959	% CHANGE 1958 to 1959	RATIO TO TOTAL TONNAGE 1958	1959
STEEL for converting & processing	2,854,574	2,765,011	− .3%	4.8%	4.2%
FORGINGS other than automotive	767,217	855,837	+11.6	1.3	1.3
BOLTS, nuts, rivets and screws	878,873	1,053,338	+19.9	1.5	1.6
JOBBERS, total	10,902,283	12,179,216	+11.7	18.2	18.5
Oil and Gas industry	1,004,510	1,777,507	+77.0	1.7	2.7
All others	9,897,773	10,401,709	+ 5.1	16.5	15.8
CONSTRUCTION and maintenance	8,722,549	8,492,534	− 2.6	14.6	12.9
CONTRACTORS products	3,467,189	3,423,347	− 1.3	5.8	5.2
AUTOMOTIVE total	10,125,034	13,430,054	+32.6	16.9	20.4
Cars, trucks, parts, etc.	9,850,140	12,969,219	+31.7	16.4	19.7
Forgings	274,894	460,835	+67.6	.5	.7
RAIL transportation total	1,472,112	2,370,010	+61.0	2.4	3.6
Rails, trackwork and equipment	584,664	847,846	+45.0	1.0	1.3
Freight & passenger cars, locomotives	866,780	1,500,028	+73.1	1.4	2.3
Street railways & rapid transportation	20,668	22,136	+ 7.1	*	*
SHIPBUILDING and marine equipment	797,511	658,336	−17.5	1.3	1.0
AIRCRAFT	62,209	65,834	+ 5.8	.1	.1
OIL and gas drilling	305,923	526,669	+72.2	.5	.8
MINING, quarrying and lumbering	179,505	197,501	+10.0	.3	.3
AGRICULTURAL total	1,193,114	1,185,005	− .7	2.0	1.8
Agricultural machinery	902,591	921,670	+ 2.1	1.5	1.4
All other	290,523	263,334	− 9.4	.5	.4
MACHINERY, industrial equipment & tools	3,181,196	4,015,850	+26.2	5.3	6.1
ELECTRICAL machinery and equipment	1,771,514	1,909,174	+ 7.8	2.9	2.9
APPLIANCES, utensils and cutlery	1,590,095	1,685,341	+ 6.0	2.6	2.6
OTHER domestic & commercial equipment	1,715,542	1,738,007	+ 1.3	2.9	2.6
CONTAINERS, total	6,568,583	6,122,525	− 6.8	11.0	9.3
Cans and closures	5,252,071	4,937,520	− 6.0	8.8	7.5
Barrels, drums and shipping pails	800,326	724,170	− 9.5	1.3	1.1
All other containers	516,186	460,835	−10.7	.9	.7
ORDNANCE and other military	238,690	197,501	−17.3	.4	.3
EXPORT	2,429,149	1,448,339	−40.4	4.0	2.2
UNCLASSIFIED	691,571	1,514,173	+18.9	1.2	2.3
TOTAL	59,914,433	65,833,602	+ 9.9	100.0	100.0

SOURCE: American Iron & Steel Institute; American Machinist

*less than .05%

Steel Output to Set New Record

Output of steel ingots and castings is expected to increase a whopping 40% in 1960 over the past year's total of about 91 million tons. The prolonged steel strike held down the 1959 performance.

Steel production thus will get up to around 128 million tons this year, an all-time record for the industry. It will top by 10% the previous high in 1955.

In view of the strike, 1959 made a remarkably good showing. Finished steel registered a gain of almost 10% over the previous year, with the total put at more than 68 million tons.

Rebuilding of steel inventories will be one of the most important factors supporting the anticipated gain of 37 million tons in production this year. Steel stocks had dwindled to about 5 million tons at the time the Taft-Hartley injunction was invoked. Stocks then were at one of the lowest points in the history of the steel industry. The restocking of steel inventories to normal levels could be responsible for nearly 20 million additional tons of steel production in 1960. Inventory accumulation, however, is likely to be slim in the first half of the year when most of the steel delivered to users will be chewed up immediately.

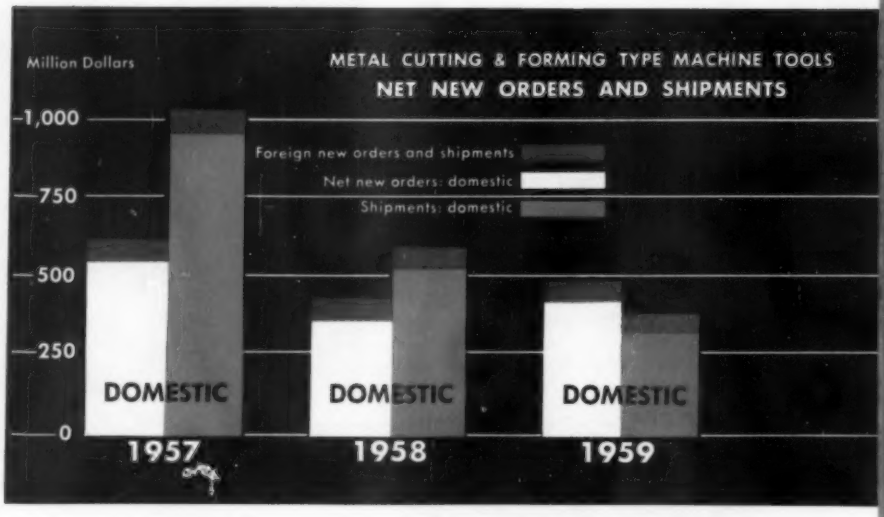
The automobile industry came back into first place as a steel consumer the past year and it will stay in this spot this year. During 1959 it took about one ton out of every five tons of finished steel and should do the same in 1960. Steel warehouses, which absorbed 18.2% of the industry's total tonnage in 1958, increased their ratio to 18.5%, but were second to Detroit in over-all volume. The capital goods industries — machinery, electrical machinery, railroad equipment, industrial construction — will need increased steel tonnage during 1960. Construction industry's steel "take" last year fell off from that of the previous year, from 14.5% to 12.9%.

1960: BIGGEST YEAR EVER . . .

Machine Tool Orders to Show Healthy Gain

The machine tool industry is well on its way out of a major recession. Its net new orders hit bottom in 1958, after a two-year drop. Last year they came back up, with total bookings for metal-cutting machines running slightly better than $500 million and those for metal-forming machines being around $148 million. Late in 1959 orders for both types of machine tools got up onto an annual basis of $750 million. The prediction for 1960 is that net new orders probably will be $850 million, with $650 million of that amount in metal-cutting machines.

The frugality of automotive purchases of machine tools has been one of the builders' troubles. During 1959 automobile makers rebuilt many machines for new production lines rather than order brand-new machines. Chances are

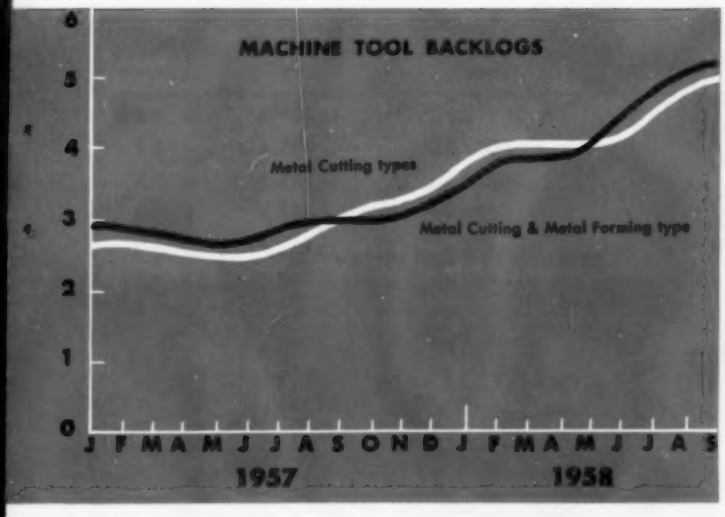


METAL CUTTING & FORMING	Million Dollars Net New Orders	Shipments	
1957	**Total**	**Total**	**Domestic**
Jan.	$ 75.5	$ 99.9	$ 89.5
Feb.	71.9	103.4	96.4
Mar.	72.8	115.6	103.4
Apr.	64.3	110.7	97.0
May	53.7	104.3	94.0
Jun.	52.8	107.0	94.6
July	62.7	81.5	73.1
Aug.	52.9	78.3	71.5
Sep.	36.8	82.1	72.7
Oct.	39.7	76.1	66.1
Nov.	35.2	59.8	51.6
Dec.	24.9	70.1	63.3
Total	**$642.9**	**$1,088.5**	**$972.9**
1958			
Jan.	$ 26.9	$ 57.8	$ 50.8
Feb.	28.3	48.1	43.2
Mar.	36.2	54.2	48.5
Apr.	28.3	50.9	44.2
May	28.1	50.1	41.1
Jun.	32.6	45.5	38.9
July	26.6	29.7	24.5
Aug.	28.3	29.8	25.0
Sep.	28.1	34.9	29.7
Oct.	37.0	41.4	35.9
Nov.	30.7	33.7	27.5
Dec.	43.0	42.9	36.9
Total	**$373.4**	**$ 518.8**	**$446.6**
1959			
Jan.	$ 41.1	$ 31.3	$ 25.8
Feb.	45.4	36.1	29.9
Mar.	51.6	45.8	39.4
Apr.	53.2	45.0	38.3
May	48.7	41.0	36.3
Jun.	65.4	50.1	45.0
July	63.4	40.6	37.0
Aug.	52.2	40.3	35.4
Sept.	58.9	46.2	42.3
Oct.	66.7	51.5	46.2
Nov.	53.7	44.2	39.0

METAL CUTTING TYPES	Million Dollars Net New Orders	Shipments	
1957	**Total**	**Total**	**Domestic**
Jan.	$ 63.3	$ 76.6	$ 67.6
Feb.	58.2	77.7	72.1
Mar.	58.9	89.1	78.8
Apr.	51.3	87.8	77.7
May	41.4	78.5	70.9
Jun.	43.1	83.0	72.9
July	55.5	58.7	51.5
Aug.	44.5	63.2	58.0
Sep.	28.8	64.8	58.6
Oct.	27.8	60.9	53.5
Nov.	28.4	47.6	41.7
Dec.	18.7	56.2	50.3
Total	**$519.8**	**$ 843.9**	**$753.4**
1958			
Jan.	$ 19.3	$ 47.8	$ 42.0
Feb.	22.8	38.5	34.4
Mar.	29.5	45.9	41.3
Apr.	22.9	40.2	35.0
May	21.9	37.6	32.7
Jun.	23.0	35.5	30.9
July	20.9	23.2	18.9
Aug.	19.3	23.2	19.3
Sep.	20.1	27.2	23.1
Oct.	28.5	32.8	29.2
Nov.	22.3	25.5	21.4
Dec.	30.2	33.1	28.5
Total	**$280.5**	**$ 410.2**	**$356.6**
1959			
Jan.	$ 29.1	$ 23.4	$ 20.0
Feb.	36.0	27.1	22.0
Mar.	40.3	37.9	32.4
Apr.	40.4	33.3	28.6
May	37.5	30.4	27.5
June	53.9	37.2	33.4
July	50.8	31.2	28.9
Aug.	42.3	31.1	27.0
Sep.	47.7	36.3	33.3
Oct.	43.6	40.2	36.6
Nov.	42.8	34.4	31.0

METAL FORMING TYPES	Million Dollars Net New Orders	Shipments	
1957	**Total**	**Total**	**Domestic**
Jan.	$ 12.2	$ 23.3	$ 21.9
Feb.	13.7	25.7	24.3
Mar.	13.9	26.5	24.6
Apr.	13.0	22.9	19.3
May	12.3	25.8	23.1
Jun.	9.7	24.0	21.7
July	7.2	22.8	21.6
Aug.	8.4	15.1	13.5
Sep.	8.0	17.3	14.1
Oct.	11.9	15.2	12.6
Nov.	6.8	12.2	9.9
Dec.	6.2	13.9	13.0
Total	**$123.1**	**$ 244.5**	**$219.5**
1958			
Jan.	$ 7.6	$ 10.0	$ 8.8
Feb.	5.5	9.6	8.8
Mar.	6.7	8.3	7.2
Apr.	5.4	10.7	9.2
May	6.2	12.5	9.1
Jun.	9.1	10.1	8.0
July	5.7	6.5	5.6
Aug.	9.1	6.7	5.7
Sep.	8.0	7.7	6.6
Oct.	8.6	8.7	6.8
Nov.	8.5	8.2	6.1
Dec.	12.8	9.8	8.4
Total	**$ 92.9**	**$ 108.7**	**$ 90.1**
1959			
Jan.	$ 12.0	$ 7.9	$ 5.8
Feb.	9.5	9.0	7.9
Mar.	11.3	7.9	7.0
Apr.	12.8	11.8	9.7
May	11.2	10.7	8.8
Jun.	11.5	12.9	11.5
July	12.7	9.4	8.2
Aug.	10.0	9.3	8.4
Sep.	11.2	9.9	9.0
Oct.	23.1	11.3	9.6
Nov.	11.0	9.8	8.0

SOURCE: National Machine Tool Builders' Association



MACHINE TOOL EXPORTS	1958	1959	% Change
	(million dollars)		
Engine Lathes	$3.6	$2.7	—25.0
Turret Lathes	2.9	2.1	—29.6
Automatic Chucking Lathes	3.8	6.7	+16.8
Automatic Screw Machines	3.7	3.8	+ 2.7
Other Lathes	1.4	1.5	+ 7.1
Boring & Turning Mills	9.8	6.7	—31.7
Tapping & Threading Machines	2.6	1.8	—30.8
Milling Machines	9.0	9.8	+ 8.8
Gear Cutting Machines	9.7	11.3	+16.4
Drilling Machines	7.1	3.7	—47.9
Planers	1.2	1.5	+25.0
Shapers	.7	.9	+28.5
Surface Grinders	3.1	3.2	+ 3.2
External Grinders	7.1	4.7	—38.9
Internal Grinders	3.6	2.4	—33.3
Tool & Cutter Grinders	2.1	1.8	—14.3
Sawing & Cut-Off Machine	1.9	1.8	— 5.3
Other Metal Grinding Machines	7.1	5.5	—22.6
All Other Metal Cutting Tools & Parts	42.2	34.4	—18.5
Metalworking Presses	18.9	19.2	+ 1.5
Bending, Roll Forming, Punching & Shearing Machines	10.2	10.9	+ 6.8
All Other Metal Forming Machine Tools & Parts	21.7	22.3	+ 2.7
Total	173.4	158.7	— 8.5

that this practice will dwindle during 1960 because most of the machines that might be adapted to future tooling requirements have already been rebuilt.

A good portion of bookings during the past year came from European automobile makers. This trend is expected to continue through the current year, as British, French, German and Italian car makers expand further their facilities. US builders of high-production and special machines did well in getting overseas business in 1959, with a surprising volume coming from Japan. A continuation of this overseas trade is expected this year.

The domestic automobile industry has not been buying its normal quota of machine tools. There is a strong feeling, however, that the shaking down of types and sizes of cars, precipitated by the introduction of compact cars, will spur substantial outlays for new capacity. Machine tool builders are convinced that business originating in Detroit will expand considerably this year.

Replacement is looming larger than ever as a prime source of machine tool orders. Normally it is subordinate to plant expansion as a factor in machine tool sales. But the pressure to attain higher productivity and lower costs is being felt and is resulting in a better-than-usual volume of replacement business.

Deep concern about world markets has led many machine tool builders to make arrangements for manufacture overseas. This trend was accelerated the past year and will continue this year. More of the arrangements have been made in Britain than anywhere else. Production overseas at prevailing costs, which are much lower than here, enables US builders to compete better in markets outside this country.

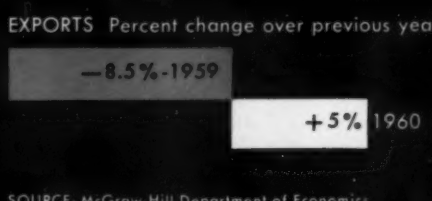
Importation of machine tools is cause of anxiety to US builders because the percentage of foreign to domestic machines tends to creep up and because US builders are beginning to act as sales agents for foreign builders.

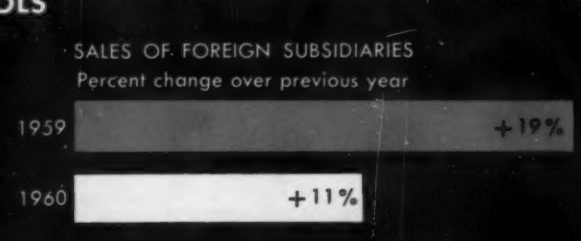
Imports are not expected to go back down to the inconsequential volume that used to prevail. They probably will stay around 5 to 6% and perhaps may rise to a higher ratio.

The machine tool industry in western Europe has been staging a comeback after a recession that was much milder than in the United States. The German and Italian industries are booming, and backlogs of British builders are growing impressively. About four out of five machine tools produced in western Europe are used in the country of origin or by other western European nations. The automobile industry in England, France, Germany and Italy has provided more orders for machine tools than any other source.

McGraw-Hill survey of proposed spending for new plant and equipment in 1960 and 1961 points to a strong replacement demand for machine tools both years. Shipments this year will be up sharply from 1959. Chances are production will be good well into 1961.

MACHINE TOOLS





SOURCE: McGraw-Hill Department of Economics

1960: BIGGEST YEAR EVER . . .

EXPORTS TO HEAD UP IN 1960

	MILLIONS OF DOLLARS		%
	1958	1959	CHANGE
Metalworking Total	$6480.7	$6101.7	— 5.8%
Electrical Machy & apparatus	1007.3	939.4	— 6.7
Power generating equipment	226.5	243.9	+ 7.7
Construction, excavating mining machinery, etc	694.9	696.7	+ 0.3
Machine tools and parts	173.4	158.7	— 8.5
Metalworking machines, parts & accessories	165.5	160.6	— 3.0
Textile, sewing, shoe machinery	94.6	97.8	+ 3.4
Other industrial machinery & parts	907.0	840.6	— 7.3
Office machines & parts	133.4	137.6	+ 3.1
Printing & Bookbinding machinery	37.7	39.8	+ 5.6
Agricultural machines, implements, parts	123.1	157.4	+27.9
Tractors, parts & accessories	310.7	368.3	+18.5
Autos, trucks, buses, trailers & parts	1299.8	1255.7	— 3.4
Aircraft, parts and accessories	972.5	739.1	—24.0
Watercraft	84.1	125.1	+48.8
Railway transportation & equipment	208.6	89.3	—57.2
Other vehicles and parts	7.2	7.1	— 1.4
Special category items	34.4	44.6	+29.7

Source: Dept of Commerce, American Machinist

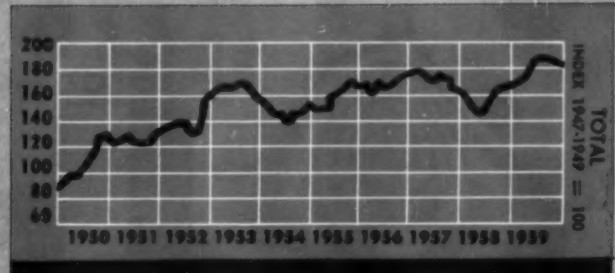
14 Countries take half of exports

	MILLION DOLLARS
CANADA	1,580
COMMON MARKET*	385
VENEZUELA	350
MEXICO	330
BRAZIL	265
ARGENTINA	155
JAPAN	150
UNITED KINGDOM	115
CUBA	100

*Germany, France, Italy, Netherlands, Belgium, Luxemburg

Source: Dept of Commerce, American Machinist

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION



	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	97	129	137	168	154	156	170	180	159	166
FEB	97	131	138	168	151	157	168	180	153	168
MAR	99	132	139	168	147	157	166	179	150	170
APR	104	132	139	169	146	160	171	176	146	173
MAY	111	132	142	169	147	162	167	175	148	179
JUN	117	131	143	168	146	163	168	177	151	184
JUL	119	128	134	171	148	167	170	177	154	186
AUG	129	127	142	171	148	170	173	177	156	183
SEP	128	130	154	166	148	171	176	174	156	183
OCT	132	132	159	165	149	174	177	169	155	181
NOV	130	134	164	159	155	172	180	170	164	171
DEC	129	136	166	157	154	172	182	163	165	175

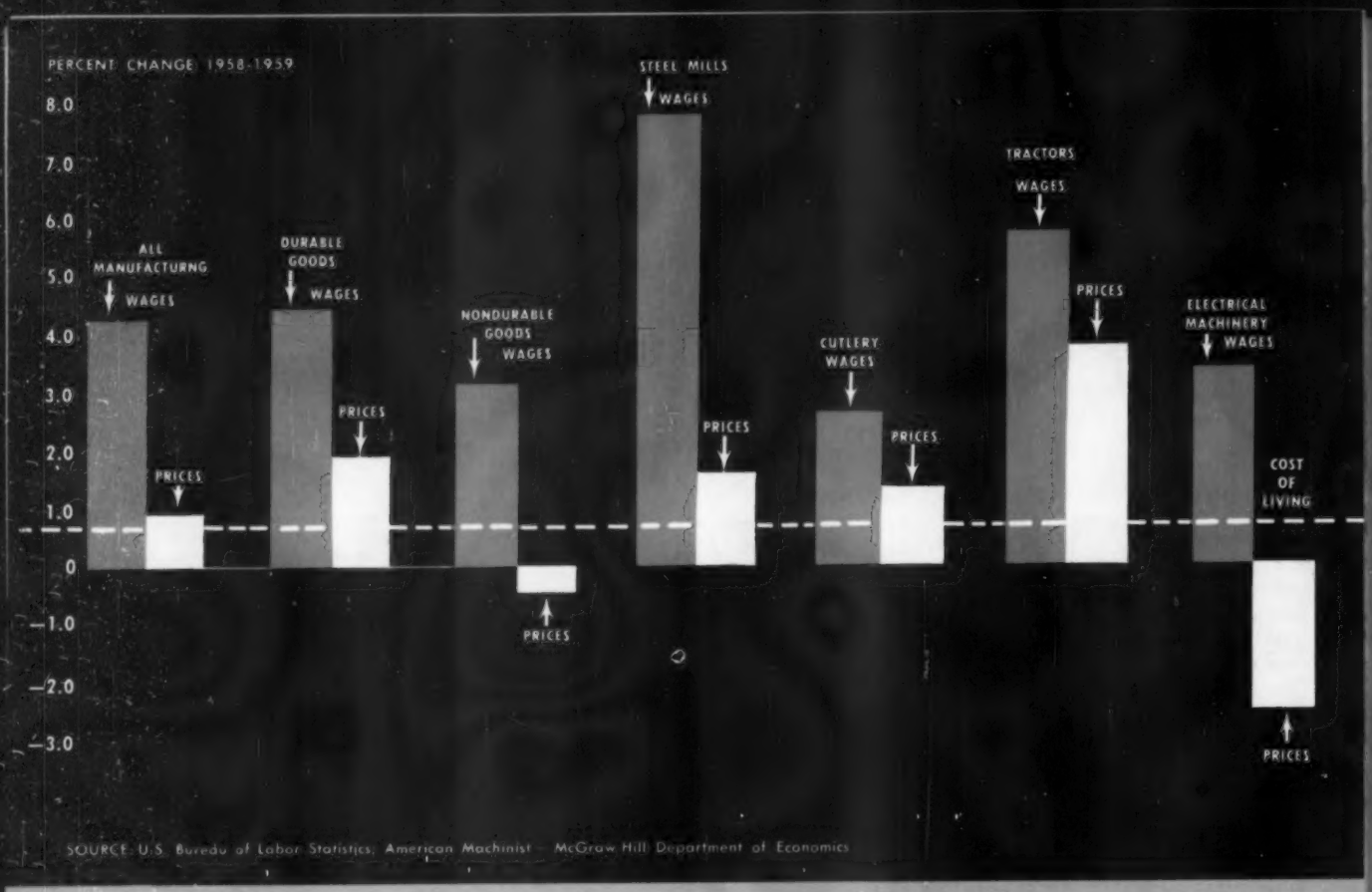
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	88	120	131	144	130	123	147	156	132	131
FEB	91	122	132	145	130	125	148	154	128	138
MAR	94	122	132	147	126	126	146	154	127	141
APR	99	126	134	147	126	130	151	152	123	145
MAY	102	125	135	146	124	134	149	152	123	149
JUN	105	127	136	144	123	136	149	151	125	153
JUL	110	126	132	145	126	136	153	152	126	156
AUG	114	127	136	145	126	139	157	151	126	159
SEP	113	128	138	141	125	141	157	151	130	157
OCT	115	129	139	141	124	145	156	146	130	155
NOV	117	129	142	137	122	143	155	142	133	154
DEC	117	130	143	133	120	143	155	136	132	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	110	148	190	203	169	188	196	207	192	199
FEB	112	147	190	200	163	187	192	205	177	199
MAR	114	149	191	195	163	185	191	204	170	194
APR	121	142	148	195	163	185	209	196	166	198
MAY	122	139	152	194	163	184	206	199	167	208
JUN	122	133	160	194	173	194	205	210	171	221
JUL	124	129	160	200	173	197	209	214	181	226
AUG	151	116	163	203	181	205	211	212	188	221
SEP	144	129	184	200	190	205	212	207	185	233
OCT	155	135	187	194	197	207	218	194	180	232
NOV	150	141	198	185	199	198	219	199	182	218
DEC	152	147	197	174	192	198	218	189	190	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	96	126	121	138	130	128	140	143	135	143
FEB	98	126	121	139	128	129	139	144	130	144
MAR	100	126	121	140	123	131	137	144	130	146
APR	104	125	119	141	122	132	140	145	128	149
MAY	109	125	120	142	124	133	136	142	126	155
JUN	115	124	118	142	125	138	138	145	132	159
JUL	120	122	115	146	126	138	138	147	135	159
AUG	125	123	123	144	126	141	140	147	137	156
SEP	127	122	129	140	124	143	140	146	141	155
OCT	128	120	133	136	126	145	150	142	140	150
NOV	126	121	135	136	128	143	144	145	143	148
DEC	126	121	138	135	129	142	145	141	143	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	114	132	103	138	119	152	152	146	120	135
FEB	102	134	102	130	114	152	139	140	104	129
MAR	106	140	106	135	116	157	134	135	94	132
APR	111	136	104	135	107	156	129	127	86	133
MAY	131	129	100	130	106	157	114	127	90	136
JUN	142	130	102	131	102	145	110	120	88	139
JUL	136	107	52	131	100	147	107	118	84	142
AUG	148	110	73	125	97	139	103	120	76	133
SEP	141	109	107	110	78	133	88	94	66	129
OCT	151	109	121	122	90	144	113	118	92	132
NOV	165	104	120	110	128	176	151	149	145	91
DEC	140	98	128	112	143	167	149	136	141	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	75	129	205	284	301	262	298	352	318	325
FEB	77	131	215	298	291	273	310	366	324	335
MAR	70	126	213	286	267	264	310	374	333	338
APR	81	136	220	286	286	272	308	375	336	348
MAY	92	151	243	301	296	278	318	371	340	351
JUN	109	149	240	288	284	280	333	376	352	351
JUL	111	170	256	310	290	298	335	371	333	351
AUG	120	171	257	307	290	315	336	370	381	350
SEP	130	181	269	316	310	334	391	399	374	338
OCT	121	181	275	298	294	323	355	346	340	333
NOV	82	203	299	297	282	275	330	292	310	330
DEC	115	211	299	302	286	294	347	312	314	



Wage Rates Rise Faster Than Prices

Average hourly wages have outstripped prices in the uptrend the past year. The rise in wage rates in all manufacturing industries amounted to 4.2%, whereas prices went up only 0.9% (based on 1947-1949 as 100).

The story is the same in both durable and nondurable goods. The increase in average hourly wages in durable goods from 1958 to 1959 was 4.4%, compared with a gain of 1.9% in prices. The contrast is even greater in nondurable goods, because prices were slightly lower than in 1958 (0.4% less) while wages rose 3.1%. There is not a single category in Metalworking in which wage rates did not go up faster than prices during the past year.

Biggest wage increase has been in stamped and pressed metal products. The rate was up 7.4% over the previous year's. The automobile, tractor, iron and steel forging, typewriter and tinware industries chalked up wage rises of at least 5½%. Every branch of the metalworking industry was paying a wage rate at least 3% higher than in 1958.

Steel mills, with an average hourly wage of $3.10, were operating on a scale higher than that in any metalworking industry. The iron and steel forging shops came next, with an average wage of $2.84. Transportation industries were not far below, with the automobile people averaging $2.70 and the locomotive parts makers $2.72. Manufacturers of machine tool accessories had one of the highest hourly rates last year — $2.80. Only in one industry, cutlery and edge tools, did the hourly rate fall below $2 ($1.98). The average in nondurable goods, however, was only $2, whereas in durable goods it was $2.38. Typewriters, radios, phonographs and TV sets were at the low end of the hourly wage bracket. The hourly wage rates in the metalworking machinery industry and in the aircraft and aircraft engine industries were $2.62.

Prices have advanced very little since 1958. In nondurable goods they were slightly lower in 1959 than in the previous year. Within five metalworking categories prices were down from the 1958 level — tin cans and other tin products, structural steel and ornamental iron items, refrigerator and air-conditioning units, electrical machinery, and radios, phonographs, TV sets and related products.

Steel foundry products scored a large increase in prices. They were up 3.4% from 1958 to 1959. But farm machinery and tractors were up even more: 3.5% and 3.6% respectively. General industry machinery prices rose about 3%. In a number of metal products the increase in price was less than 1%. That was true in such products as hardware, oil burners and nonelectrical heating goods, boiler shop products, and construction and mining machinery. Malleable iron foundry products were unchanged during the year, while engines and turbines went up only 0.1%.

Wages in 1960 probably will increase around 3 to 4%. Just as in 1959, workers in the durable goods industries will get a bigger average wage hike than those in the nondurable goods industries. Prices of manufactured goods are likely to go up a little faster this year than last, but not as much as wage rates.

Stamped and pressed metal products increased more in price during the 1950's than any other group in Metalworking. Refrigerators, air conditioning units, radios, phonographs and TV sets sold for less in 1959 than in 1950.

WHAT'S HAPPENING TO WAGES AND PRICES

	AV. HOURLY WAGES			PRICES index 1947-49 = 100		
	1958	1959	% Inc.	1958	1959	% Inc.
All Manufacturing Industries	$2.13	$2.22	+4.2	124.5	125.6	+0.9
Durable Goods	2.28	2.38	+4.4	144.0	146.7	+1.9
Non-durable Goods	1.94	2.00	+3.1	109.2	108.8	–0.4
Steel Mills	2.88	3.10	+7.6	202.0	205.1	+1.5
Gray Iron Foundries	2.27	2.40	+5.7	150.4	154.0	+2.4
Malleable Iron Foundries	2.28	2.38	+4.4	181.0	181.0	0
Steel Foundries	2.43	2.55	+4.9	180.8	187.0	+3.4
Iron and Steel Forgings	2.69	2.84	+5.6	N.A.	N.A.	N.A.
Wire Drawings	2.51	2.65	+5.6	164.4	166.8	+1.5
Tin Cans & Other Tinware	2.51	2.65	+5.6	155.7	154.3	–0.9
Cutlery & Edge Tools	1.93	1.98	+2.6	170.8	173.0	+1.3
Hand Tools	2.19	2.27	+3.7	181.5	185.8	+2.4
Hardware	2.23	2.31	+3.6	157.8	159.0	+0.8
Oil Burners, Non-Electric Heating & Cooking Apparatus	2.17	2.24	+3.2	121.2	121.8	+0.5
Structural Steel & Ornamental Metalworking	2.33	2.40	+3.0	141.8	136.6	–0.4
Boiler Shop Products	2.37	2.45	+3.4	129.3	129.9	+0.5
Sheetmetal Work	2.37	2.46	+3.8	102.3	105.0	+2.6
Stamped & Pressed Metal Products	2.42	2.60	+7.4	203.3	197.7	–2.8
Machinery (except electrical)	2.38	2.49	+4.6	155.2	158.8	+2.3
Engines and Turbines	2.55	2.67	+4.7	155.2	155.4	+0.1
Tractors	2.51	2.65	+5.6	133.2	138.0	+3.6
Agricultural Machinery (exc. tractors)	2.33	2.44	+4.7	144.2	149.3	+3.5
Construction & Mining Machinery	2.35	2.46	+4.7	183.2	184.1	+0.5
Machine Tools	2.39	2.52	+5.4	N.A.	N.A.	N.A.
Metalworking Machinery (except machine tools)	2.51	2.62	+4.4	170.1	174.0	+2.3
Machine Tool Accessories	2.67	2.80	+4.9	170.9	173.8	+1.7
Special Industrial Machinery	2.25	2.33	+3.6	N.A.	N.A.	N.A.
General Industrial Machinery	2.35	2.45	+4.3	160.0	164.8	+3.0
Computing Machinery & Cash Registers	2.55	2.67	+4.7	126.8	128.0	+0.9
Typewriters	2.00	2.10	+5.0	145.1	148.0	+2.0
Service, Industrial & Household Machinery	2.29	2.39	+4.4	104.7	104.8	+0.1
Refrigerators, and Air Conditioning Units	2.30	2.41	+4.8	90.3	88.8	–1.7
Electrical Machinery	2.15	2.22	+3.3	158.8	154.7	–2.6
Communications Equipment	2.07	2.14	+3.4	N.A.	N.A.	N.A.
Radios, Phonographs, Television Sets & Equipment	2.04	2.12	+3.9	94.4	93.8	–0.6
Automobiles	2.55	2.70	+5.9	139.7	143.2	+2.5
Aircraft	2.51	2.63	+4.8	N.A.	N.A.	N.A.
Aircraft, Engines & Parts	2.54	2.63	+3.5	N.A.	N.A.	N.A.
Ship and Boat Building & Repairing	2.50	2.60	+4.0	N.A.	N.A.	N.A.
Locomotives & Parts	2.63	2.72	+3.4	N.A.	N.A.	N.A.
Railroads and Street Cars	2.66	2.75	+3.4	N.A.	N.A.	N.A.

SOURCE: U.S. Bureau of Labor Statistics; American Machinist

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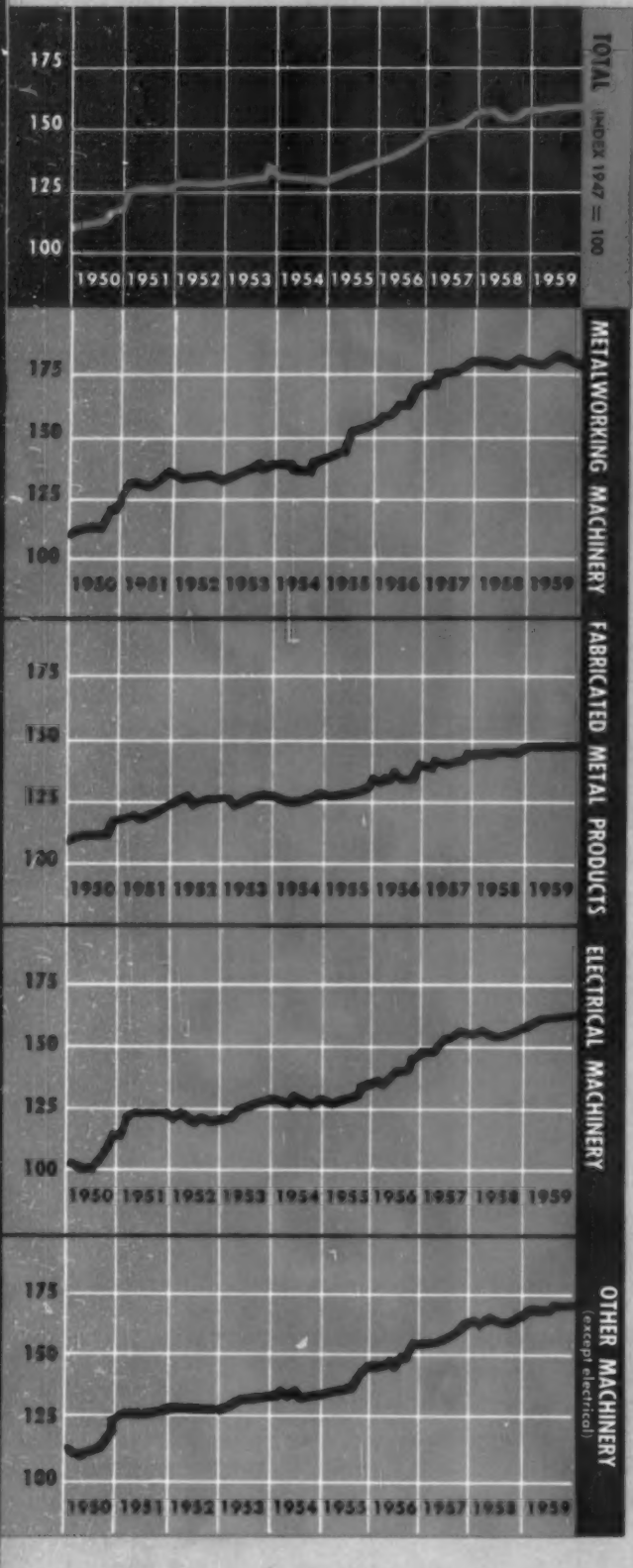
AMERICAN MACHINIST INDEX OF METALWORKING PRICES



	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	114.1	126.7	129.2	129.8	132.9	133.9	141.5	151.1	156.2	158.2
FEB	114.1	127.1	130.0	129.8	132.8	134.2	141.9	151.5	156.0	158.4
MAR	114.1	127.8	129.8	129.6	132.8	134.2	142.1	151.7	156.0	158.5
APR	114.3	127.8	129.7	129.9	132.6	134.5	143.5	151.9	155.9	158.5
MAY	114.5	127.8	129.7	130.4	132.4	134.7	143.9	151.9	155.8	158.7
JUN	114.7	127.8	129.4	130.9	132.5	135.1	144.0	151.9	155.9	159.2
JUL	115.4	127.8	129.4	131.5	132.4	135.8	144.6	152.7	155.8	159.3
AUG	117.4	127.8	129.6	132.1	132.6	137.1	145.5	153.4	155.8	159.4
SEP	119.2	128.2	129.6	132.5	132.8	139.0	147.5	153.9	155.8	159.7
OCT	121.0	128.7	129.6	135.2	132.7	139.9	149.1	154.7	156.3	159.5
NOV	122.1	128.9	129.5	132.6	133.5	140.9	150.8	155.9	157.5	159.6
DEC	125.3	129.1	129.7	132.6	133.8	141.3	150.5	156.2	157.9	159.6

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	113.7	133.8	136.2	137.8	141.8	144.3	160.9	174.5	183.0	182.4
FEB	113.7	133.8	136.8	137.8	142.0	145.9	161.5	174.9	182.5	182.6
MAR	114.1	133.8	136.6	137.9	142.0	146.2	162.2	176.1	182.3	183.8
APR	115.6	133.8	136.6	138.6	141.6	146.4	164.3	176.5	182.3	184.2
MAY	115.8	133.7	136.7	138.9	141.6	149.0	165.0	176.9	181.1	184.9
JUN	116.2	133.2	136.6	140.2	141.6	152.4	165.8	176.9	180.9	185.7
JUL	117.6	133.2	137.8	140.8	141.6	155.4	165.8	177.4	181.2	185.6
AUG	121.2	133.5	137.9	140.9	141.7	156.7	167.8	178.4	180.8	187.8
SEP	123.0	134.2	138.0	141.8	142.4	156.9	170.5	180.3	180.8	187.9
OCT	124.6	135.3	137.9	141.7	143.1	157.2	172.4	182.4	181.6	188.6
NOV	127.4	136.7	137.7	141.8	143.1	158.1	174.1	183.0	181.6	188.9
DEC	131.8	137.2	137.8	141.8	143.9	158.6	174.4	183.0	182.2	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	115.1	123.1	126.7	128.3	129.3	130.6	136.0	143.1	146.7	148.6
FEB	115.1	123.4	128.2	128.3	129.1	130.5	136.5	143.3	146.6	148.7
MAR	115.1	124.8	128.1	127.6	129.0	130.5	136.4	143.4	146.6	148.7
APR	115.2	124.8	127.9	127.3	128.9	130.8	137.8	143.4	146.4	148.8
MAY	115.3	124.8	127.9	127.6	128.7	130.8	137.5	143.3	146.4	148.8
JUN	115.3	124.8	127.8	127.8	128.7	131.0	137.5	143.2	146.3	148.8
JUL	115.7	124.8	127.8	128.2	128.7	131.5	137.6	144.0	146.2	148.6
AUG	116.3	124.8	128.0	128.8	129.1	132.4	138.5	144.4	146.2	148.5
SEP	117.9	125.3	128.0	129.0	129.2	132.9	140.0	144.5	146.2	148.8
OCT	119.6	126.2	128.2	128.9	129.0	134.7	141.4	144.9	146.7	148.3
NOV	120.3	126.3	128.0	128.9	130.3	135.9	143.3	146.5	148.3	148.3
DEC	122.3	126.6	128.2	128.9	130.7	136.0	143.3	146.8	148.4	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	105.2	126.6	126.5	124.5	132.0	132.0	137.8	152.0	157.2	158.9
FEB	104.4	126.8	126.6	124.6	132.0	131.9	137.6	153.1	157.5	158.6
MAR	104.8	126.7	126.5	124.8	132.0	131.6	139.1	153.5	157.5	159.4
APR	104.6	126.8	125.9	126.3	131.7	131.6	141.2	153.9	158.0	159.3
MAY	104.7	126.8	125.8	127.6	130.1	131.7	142.6	154.3	158.5	160.4
JUN	106.3	126.8	124.9	129.3	131.1	131.7	143.2	154.3	158.9	160.5
JUL	108.3	127.2	123.9	129.9	131.0	131.9	143.0	155.6	158.9	162.5
AUG	113.5	127.1	124.7	130.7	130.9	132.9	143.7	155.7	159.1	162.2
SEP	115.2	127.1	124.6	131.4	130.9	136.0	147.8	157.0	158.8	162.5
OCT	118.8	126.8	123.9	131.7	130.3	136.1	149.1	156.9	158.8	162.4
NOV	119.2	127.1	124.4	131.8	131.9	136.8	151.2	157.0	158.6	162.4
DEC	124.8	126.8	124.5	132.0	132.0	137.5	151.4	157.1	158.6	

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	115.4	131.4	132.8	132.4	137.4	138.0	148.1	159.7	166.6	169.3
FEB	115.6	132.1	132.9	132.5	137.5	138.8	148.3	160.0	166.2	169.9
MAR	115.6	132.1	132.5	132.8	137.6	138.9	148.7	160.3	166.0	169.8
APR	115.9	132.1	132.5	133.8	137.5	139.2	149.5	160.6	166.1	169.6
MAY	116.0	132.1	132.5	134.3	137.5	139.5	151.0	160.6	165.8	169.6
JUN	116.1	132.1	132.2	135.0	137.5	139.7	150.9	160.8	166.1	171.0
JUL	116.9	132.2	132.2	135.9	137.3	140.3	152.6	161.4	166.0	171.1
AUG	119.7	132.1	132.2	136.4	137.4	142.6	153.3	162.7	165.9	171.3
SEP	122.0	132.2	132.2	137.0	137.5	145.2	155.3	163.6	165.9	171.5
OCT	123.4	132.3	132.1	137.1	137.6	146.6	157.3	165.1	166.5	171.7
NOV	125.0	132.4	132.2	137.3	137.6	147.4	158.5	166.1	167.8	171.9
DEC	129.4	132.5	132.3	137.4	137.6	148.0	159.0	166.4	168.8	

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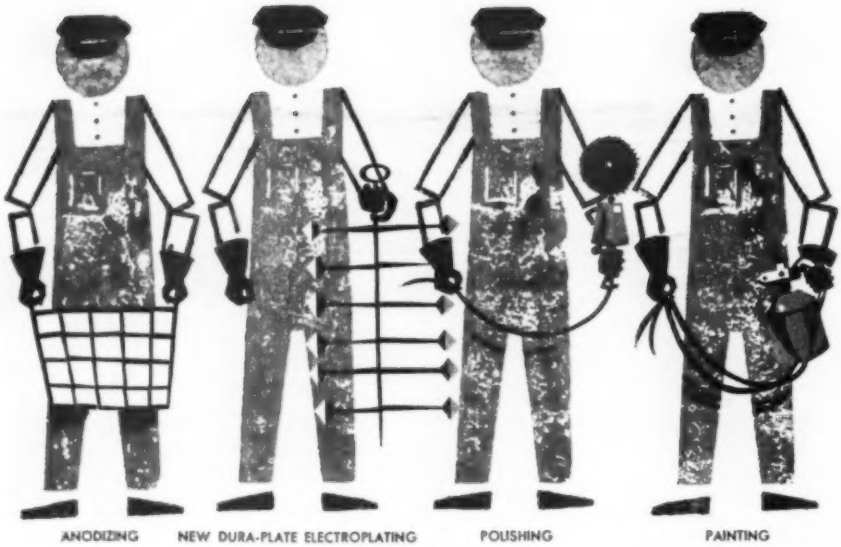

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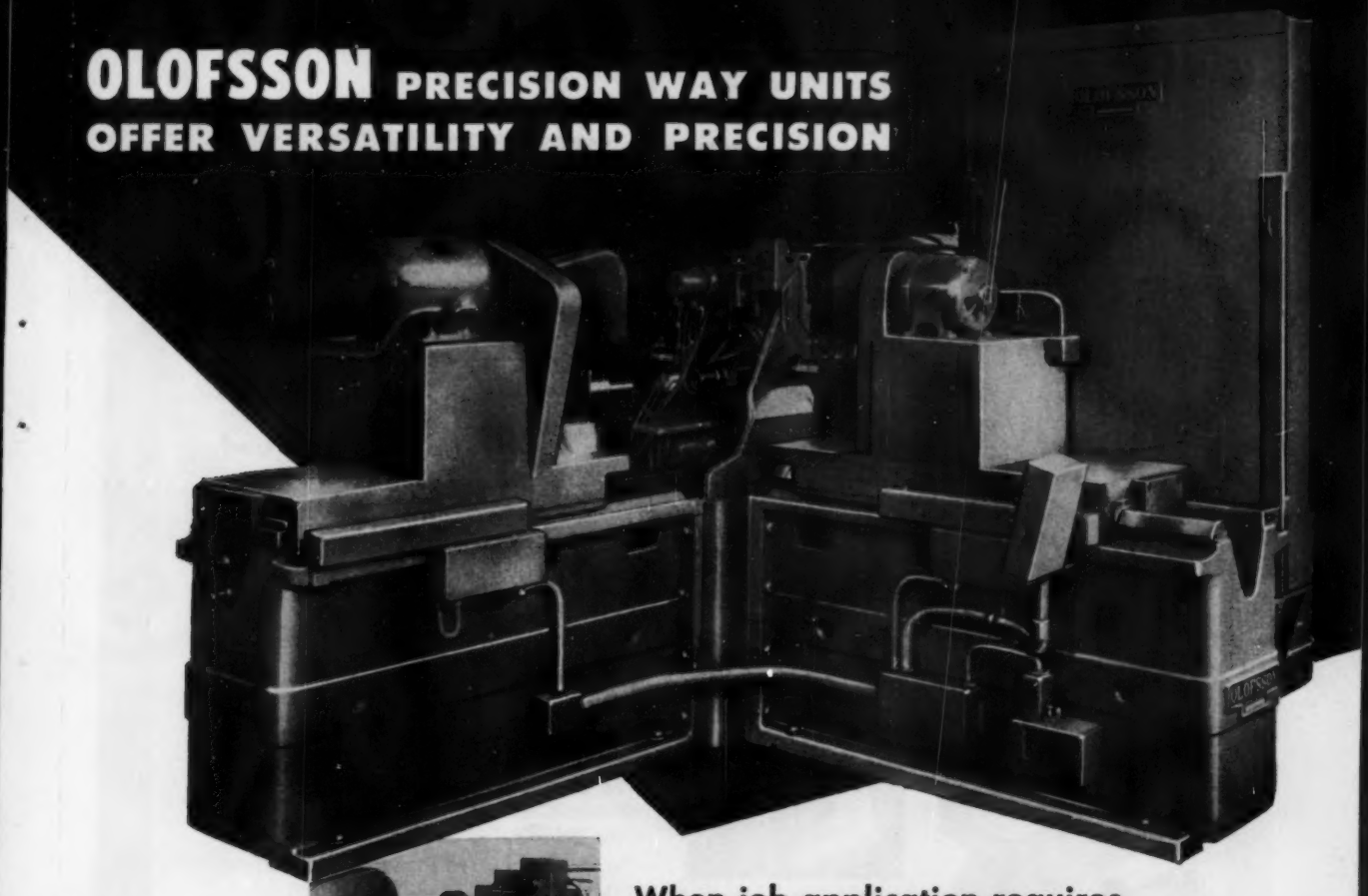
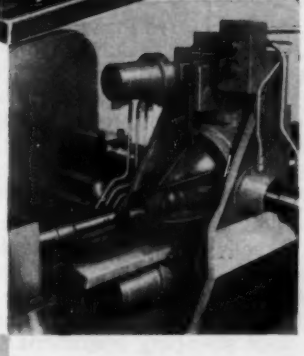
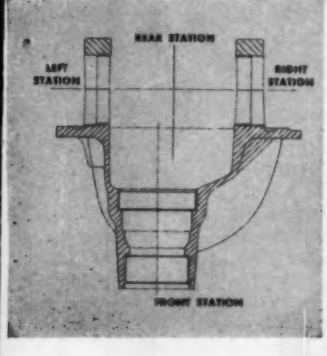




Differential carrier, hydraulically cam-clamped in position for simultaneous precision boring.

Cross-section of differential carrier illustrating various operations performed.



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These Units can be arranged to meet your particular production requirements. Use one way unit . . . two units at either 90° or 180°, 3, 4 unit, or multilpe units. Units can be combined with a center fixture section to suit production requirements.

The 4-Way Machine illustrated above makes 4 precision bores simultaneously. Diameters are held to .0005″ with the required 90° angles. When required, progressive operations can be performed on the part. Units are electrically interlocked, operate from a single push-button station.

For a demonstration on how Olofsson Way Units can suit your particular production requirements, call on your local Olofsson representative.

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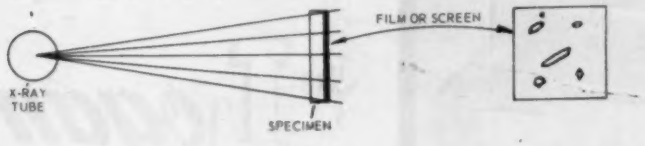
REFERENCE BOOK SHEET

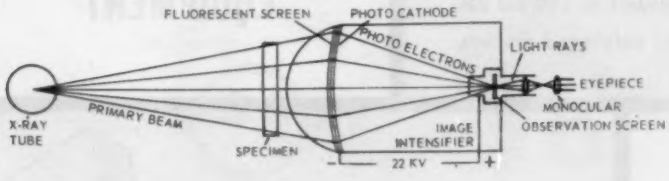
X-Ray Methods—I

By Vern W Palen, Philips Electronic Instruments, Div of Philips Electronics & Pharmaceutical Industries Corp, Mount Vernon, N Y



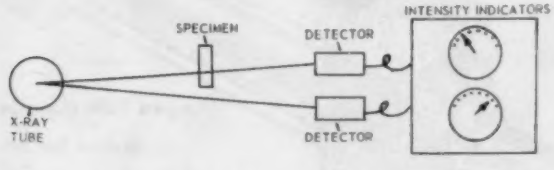
1 . . Industrial Radiography and Fluoroscopy

Equipment checks internal physical structure of many materials. Spots on films indicate voids or other density variations. High voltage X-ray units produce "hard" radiation needed to penetrate thick specimens.



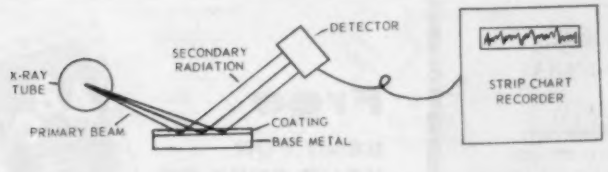
2 . . Industrial Fluoroscopy with Image Intensifier

Used for inspection of steel welds, heavy rubber sections, honeycomb, thick plastic parts ordnance materials, homogeneity of fuel elements.



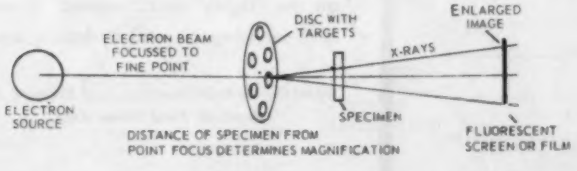
3 . . X-Ray Absorption

Instrument compares direct intensity from X-ray tube with that remaining after passing through specimen. The ratio of the two readings determines chemical composition by applying laws of X-ray absorption.



4 . . X-Ray Fluorescence Absorption

Instruments used for measuring tin coating on steel plate and other similar applications. Primary beam causes base metal to fluoresce. Secondary rays are partially absorbed by coating. Detected intensity remaining is a measure of coating thickness.



5 . . Projection Microradiography (X-Ray Microscopy)

For critical evaluation of opaque specimens. By choice of different targets during operation, stereo micrography and absorption analysis are handled on this instrument. An adjunct to light and electron microscopy.

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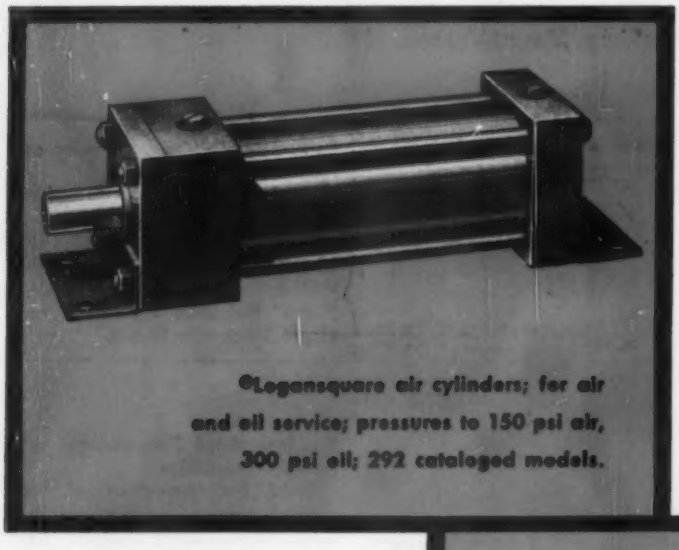

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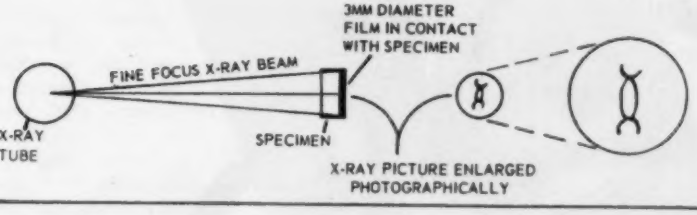
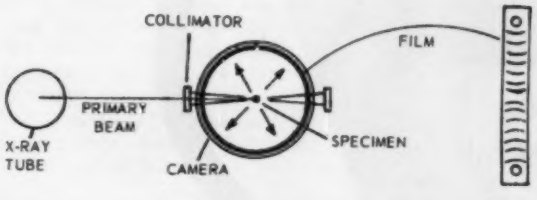
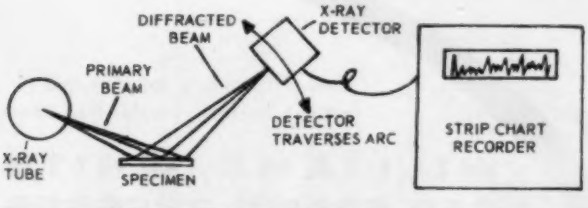
X-Ray Methods—II



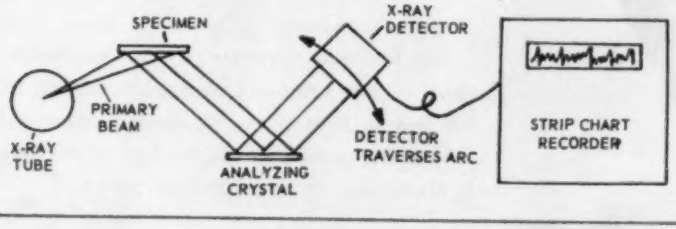
6 . . Contact Microradiography
For examining opaque minute specimens for microscopic detail. Small table unit employs 5 kv or less to produce "soft" X-rays needed for work on thin foil specimens.



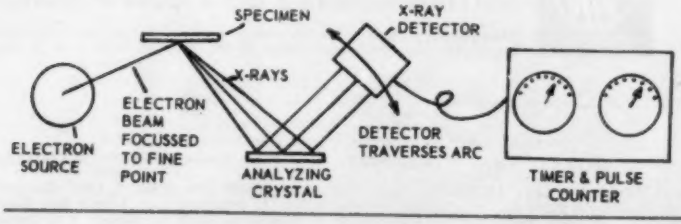
7 . . X-Ray Diffraction
Analyzes for all compounds such as NaCl (sodium chloride). Each substance produces a different X-ray "fingerprint." Curved lines are produced on film by X-rays diffracted by atoms in specimen.



8 . . X-Ray Diffractometry
Analyzes for all compounds such as NaCl (sodium chloride). Same principle as diffraction except film replaced with detector and chart to give faster, more accurate data. Eliminates film processing and measurement.



9 . . X-Ray Spectrography (Fluorescence)
Analyzes for elements in atomic range from No. 12 (magnesium) to No. 98 (californium). Automatic X-ray spectrograph is available for production line control with strip chart replaced with printout console. Results are printed on tape for as many as 24 elements as fast as samples are inserted.



10 . . Electron Microbeam Probe
For qualitative and quantitative analysis of specimen surface in one cubic micron area. Used with optical microscope for studying varying composition in localized regions. Specimen acts as target and gives off X-rays from spot. Electromechanical devices provide motion for scanning the specimen.

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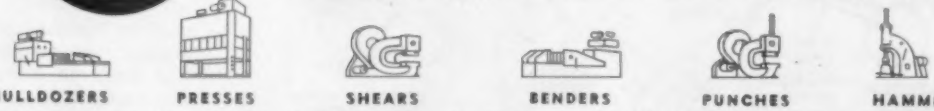

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Adapters for Air Cylinders

Abstracted from American Standard ASA B 5.5—1959, "Rotating Air Cylinders and Adapters," published by the American Society of Mechanical Engineers, 29 W 39th St, New York 18.

These standards have been developed to obtain interchangeability of different makes of air cylinders on the spindles of machine tools without changing the adapter or draw rod.

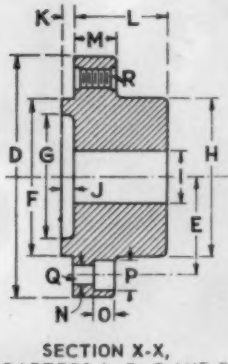
Standard adapters are always made with hubs large enough to take care of the majority of cases. Dimensions of the standard adapters allows the purchaser to determine whether he can bore and thread the standard adapter to fit the machine on which he wishes to install the cylinder. If the dimensions are not satisfactory, he can order special adapters or make his own adapter to fit the standard cylinders.

Adapter Screws and Tapped Holes

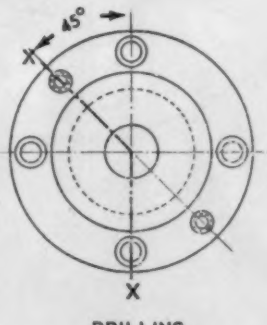
Size	Socket Capscrews[1]			Tapped Holes[2] for Jackscrews
	No. Reqd.	Size	Length Under Head	
A	4	3/8—16	1	3/8—16
B	4	1/2—13	1 1/4	1/2—13
C	6	5/8—11	1 1/2	5/8—11
D	6	3/4—10	1 3/4	3/4—10

[1] Equally spaced on radius E, UNC-2A
[2] Two holes, 180° apart on radius E, UNC-2B.

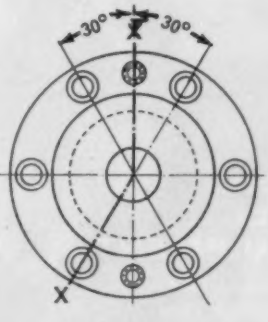
Sizes A, B, C and D



SECTION X-X, ADAPTERS A, B, C AND D



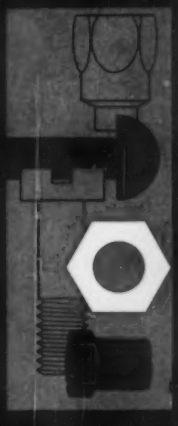
DRILLING, ADAPTERS A AND B



DRILLING, ADAPTERS C AND D

Size of Adapter	Corresponding Air Cylinder Sizes	Outside Diam D	Radius of Bolt Circle E[4]	F[1,2]	G	Diam of Hub H	Bore of Hub I	Max J	K	L	Thickness of Flange M	N[3]	Counterbore Depth O	Counterbore Diam P
A	3 and 4 1/2	4-5/8	1-7/8	3.000	2-3/8	3-1/16	1-1/16	15/16	1/4	1-3/4	3/4	13/32	3/8	19/32
B	6 and 8	6-3/4	2-3/4	4.500	3-3/4	4-5/8	1-5/16	1- 3/16	1/4	2-5/8	7/8	17/32	1/2	25/32
C	10, 12, 14, 16 and 18	8-3/8	3-1/2	6.000	5-1/4	6	2-1/16	1- 5/16	1/4	2-5/8	1-1/8	21/32	5/8	29/32
D	20 and larger	8-3/8	3-1/2	6.000	5-1/4	5-7/8	2-9/16	1- 5/16	1/4	2-5/8	1-3/8	25/32	3/4	1- 1/32

All dimensions given in inches.
[1] Note — A tolerance of —.002 is permitted on this diameter.
[2] Note — Chamfer corner on diameter "F", 1/32 inch.
[3] Note — Four equally spaced holes of diameter "N" are provided in adapters "A" and "B" and six in adapters "C" and "D", these holes all being counterbored depth "O" and diameter "P".
[4] Note — Holes equally spaced and located within .006R of true position.



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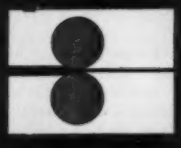
Cold Headers • Parts Formers • Nut Formers • Slotters • Threaders • Pointers • Trimmers and other Cold and Hot Forming Equipment

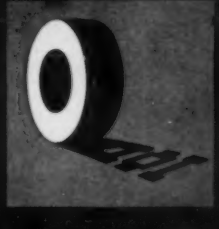


ROLLING MILL MACHINERY

Two-High and Four-High Mills • Special Mills • Sendzimir Mills • Rod Mills • Slitters • Coilers • Winders • Straighteners • Payoffs • Edgers • Coil Boxes • And Other Mill Equipment

WATERBURY FARREL

MACHINERY BUILDERS



WIRE MILL EQUIPMENT

Continuous Tandem And Upright Cone Wire Drawing Machines • Bull Blocks • Wire Flattening Mills •

Swagers • Roll Pointing Machines • Spoolers • And Other Wire Equipment

POWER PRESSES

Cam and Crank Eyelet Machines • Horizontal Redraw Presses • Multiple Plunger Pillar Presses • High Speed Blanking Presses • Collapsible Tube Equipment • Ammunition Machinery, etc.

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
DIVISION OF TEXTRON INC.
Waterbury, Connecticut • U.S.A.
Sales Offices Chicago • Cleveland • Los Angeles • Millburn, N. J.

Talking Shop...

Bicycle Into Space

FAR FROM BEING a pampered master of push-button slaves, the men who go into space may spend a good part of their time riding a "bicycle." Ezra S Krendel, head of the engineering psychology branch of Franklin Institute, Philadelphia, implied this possibility in an ASME paper. He said that a human passenger in a space vehicle might have to supply some of his own power, by a pedal operated generator, to save the weight and space used by other power sources such as batteries. In addition, it would provide a form of exercise for the spaceman, and possibly help relieve tension. Mr Krendel's interest in "man-generated-power," the title of his paper, stems from his study of military equipment that can be hand, or foot, operated if other power sources fail. Lenardo da Vinci's "Ornithopter" may get even further off the ground than even he anticipated 450 years ago.

Why Plants Don't Bloom

COUPLE OF WEEKS back we had a talk with Maurice Fulton and Leonard Yaseen, who head up Fantus Factory Locating Service, an outfit that contracts to find the most desirable location for a new plant from such varied standpoints as labor rates, availability of utilities, markets, materials, taxes, freight rates and the like.

Asked what are the most common errors made by firms in setting up new plants or relocating old ones, they listed five: (1) Confusing labor *rates* with labor *costs* (failure to take cost of fringe benefits into account); (2) Placing too much faith in sales pitches of Chambers of Commerce and other local groups, (3) Failure to make a correct assessment of moving costs, (A Metalworking firm that figured cost of moving at $200,000 wound up with a bill for $2,500,000), (4) Failure to understand local restrictions on use of such utilities as gas, water and electricity, and probably most important of all—(5) failure to recognize the impact of neighboring industries on your new plant.

For instance, your seasonal business peak may coincide exactly with that of one or more plants in the area, causing cutthroat competition for labor at certain seasons, and a glut of labor at others. Another example: You move a plant into a cheap labor area, where the average number of paid holidays per year is five. You're all set to let profits roll in when you find that just one plant in the area is paying 40¢ an hour over the prevailing wage rate and is giving 11 paid holidays a year—and that plant is the one right next door to your new one. Your employees come to work, on say Veterans' Day, theirs don't. Then your people get to talking with theirs about wages . . . and you've got labor troubles in a hitherto trouble-free area.

Word Game

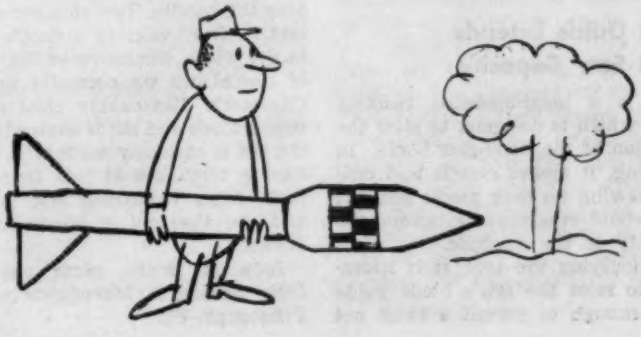
DETROIT'S CORPS of 40-or-so automobile writers, bewildered by the varying sizes of existent or about-to-be U S small cars, have tentatively decided among themselves to call all U S cars of 100-in. wheelbase or less "compact compact" cars, those of 100 to 110-in. wheelbase just plain "compacts," and those such as the forthcoming 114-in.-wheelbase Comet "king-size compacts." Reminds us of the old W C Fields movie in which he bills a normal-sized man and woman as "the world's tallest midget" and "the world's shortest giant."

Technology Triumphs Again!

WAR IS GETTING too costly, true; but it's also getting too complicated. According to Admiral Smedberg, commander of the 2nd Fleet, it was only with the technical assistance of civilian personnel loaned to the Navy to operate last-minute electronic gear and such that the Navy was able to show up as well as it did in recent Nato exercises. When a modern naval formation consists of ships all at least 35 min from each other—completely out of sight, but in radar range—communication is vital.

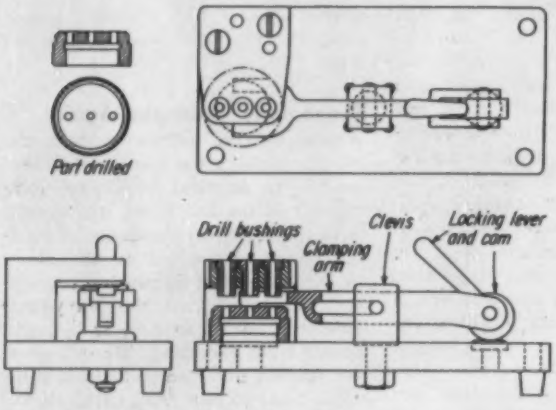
Another sidelight from the recent American Ordnance Association meeting in New York came from General Sink, 18th Airborne Corps. Although helicopters are dandy instruments and are invaluable, it is a proud squadron that can get 60% of its choppers into the air at once. Some 25 hours of maintenance work are required for each hour in the air. The General wants throw-away equipment, such as radios, that can be as easily discarded in case of failure as GI watches.

On service reliability of missiles, the General noted that standard practice has been to set up two Honest John missiles at once, in case the first one fails to shoot. In no case has the second Honest John been required, though once the first one hit several hundred yards in front of its target . . . which is no worse than many cases in history when Artillery has shelled men on its own side of the fight.



Practical Ideas...

Speeds Production Fast-Working Locking Device



A simple twist of the wrist and a piece is securely locked in the jig. Another twist, in the opposite direction, and the piece is just as quickly released. This describes the entire lockup operation for the drill jig shown which was designed to simplify a second operation on small cup-shaped parts.

The operation requires three holes to be drilled into the top of the parts, in line and equally spaced. A plate carrying three drill bushings and mounted on a block, plus a locating button, concentrically positioned under the center bushing, effectively fills the drill-guide requirements. Once the work is loaded, the locking device holds it in place during the operation.

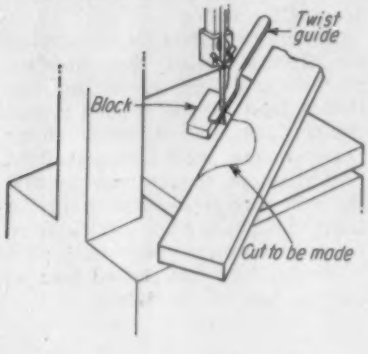
Consisting of a clamping arm with a fork to apply pressure on both sides of the row of holes, and a cam to supply the force, the device operates in a clevis recessed in a jig base. All the motion necessary to withdraw the clamping arm from the workpiece is provided for in an elongated slot through the arm. A standard dowel pin serves as the fulcrum and is pressed into the clevis-pin hole.

Operating in the outer end of the arm, which is also in the form of a clevis, is a hardened cam. It is equipped with a lever which should be inserted to assume the angle shown before the cam reaches its high point. A striking surface for the cam is made in the shape of a button and recessed into the base.

To use the jig you simply drop a workpiece onto the locating button while the clamp is retracted. (In this position, as the clevis pin rests in the fork end of the slot, the cam lever hangs over the edge of the base.) With the cam lever held horizontally the clamping arm is pushed forward until stopped by the clevis pin. The lever is then swung upwards to lock the piece. Swinging the lever down and pulling the arm back releases the piece. There is no fumbling with straps or wrenches necessary.

Adjustments to increase or decrease the clamping arm's capacity, in order to properly position the cam, can be made on the clevis. If an increase is desired, a shim or two placed under the clevis will do. If capacity must be reduced, a skim off its footing is all it takes.

Hjalmar Dahl, Upplands Vasby, Sweden



Twist Guide Extends Band Saw Capacity

Here is a hand-operated twisting guide which is designed to alter the direction of the band-saw blade. In so doing, it makes cutoffs and contour sawing on long pieces possible that would otherwise be beyond the capacity of the machine.

In applying the tool, it is necessary to raise the saw's blade guide high enough to permit a twist not harmful to the blade. Most of the time it will be possible to start a cut without putting a twist on the blade, and only when the work contacts the saw column is the twist guide required. However, should a cut have to be started with a blade twisted outwardly, a block to raise the tool to the height of the work will be necessary as it is designed to ride on top following a line.

A piece of flat tool steel is used in the construction of the twist guide. It is bent to the shape shown to allow room for the fingers gripping the handle. Two slits are sawed into its front edge to a depth equal to the width, exclusive of the teeth, of the blades we normally use for this work. Reasonably close fit between blade and slit is assured when the slit is carefully made with blade having teeth set at less than normal. After deburring and general cleanup, the tool is hardened and drawn.

John M Breen, plant engineer, Duer Spring & Manufacturing Co, Pittsburgh, Pa.

How to Shrink a Ball Bearing

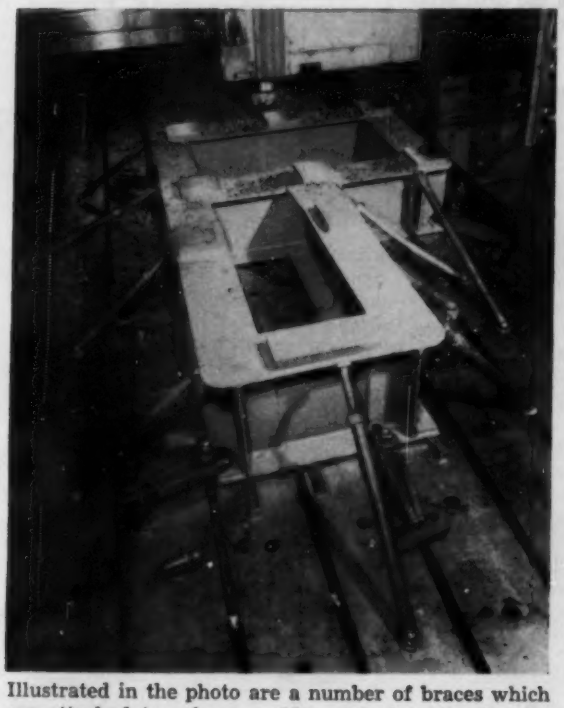
When a ball or roller bearing works itself loose on a shaft there is either one of two ways out. One is to rework the shaft to fit the bearing—by building it up with metalizing or by turning a new one. Your second choice is to get a bearing with a smaller inner-race diameter and reduce the shaft to suit.

However, when time doesn't permit reworking a shaft, or if a suitable bearing isn't available, this quick-and-dirty process will tighten a bearing in a matter of minutes. After removing the bearing, make a series of score marks in the bore of the inner race with an etching pencil. This raises enough metal for the bearing to key itself onto the shaft, making a temporary, quite solid, bond until proper repairs can be made.

One word of caution should be added at this point; make sure that ground contact is made directly to the inner race during the etching.

Harvey Muller, Danboro, Pa

Work Braces Dampen Vibrations



Illustrated in the photo are a number of braces which are attached to a large weldment to improve its stability. Without these supports vibrations set up by the cutting action would be intolerable and, as a result, the finish would suffer. Setups for machining castings are also improved with these supports.

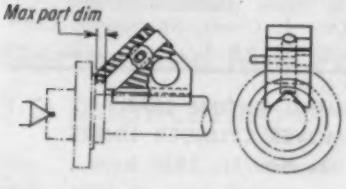
The parts necessary to make up a support are easily available around any shop and only one of them require machining. This is the anchor pin which is made in two models. One type is made with a pin to fit the holes usually found in the tables of large machines. The other has a key-shaped bottom to suit the T-slots in the table, but is used only when support is needed at right angle from the slot. Both have a ball-shaped top of approximately 1⅜ in. dia.

The rest of the parts are: various lengths of 1-in. black-iron pipe, 1-in. bolts with running threads, and 1-in. hex nuts. Two V-grooves are cut across the top of each bolt head to provide a grip on the edge of the work.

Braces are applied after the workpiece has been positioned and strapped to the table. The anchor pins are then located in table holes and slots not too close to the work. The idea is not to jack the work off the table, but to provide a push towards the center with much the same effect that guy wires would pull away from the center.

Nuts are next run up on the bolts which are slipped into suitable lengths of pipe. After seating the pipes on anchor-pin heads, the nuts are backed down to bear against the pipes with an equal amount of strain on all sides.

J M Askins, Lufkin, Texas



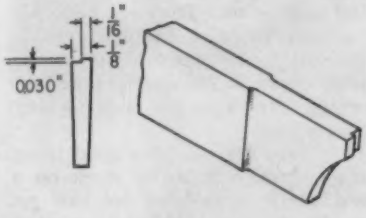
Flush-Pin Gage Checks Work in Lathe

The gage shown was designed to check a dimension with a tolerance of 0.004 in. on a part held between centers. A tolerance of 0.005 in. is generally the minimum limit practical to check with a flush-pin gage. However, by designing the gage with a pin at a 45° angle, the resulting step on the gage is increased by a factor 1.414 (the secant of 45°) or in this case to 0.0057 in.

A 90° V locates the gage body on the work with its left-hand end ground at 90° to the V, resting against the most distant face to be gaged. The face nearest to the gage is contacted by the pin which has its gaging surface ground at 45° to its axis. The pin is also provided with a retracting pin working in an elongated slot in the body.

Before preparing the back end of the pin, the gaging surfaces are set to the maximum part dimension and secured by a setscrew against the pin. The end is then ground flush with the body finishing with a 0.0057 in. gaging step across half of the pin.

F Murray, Chicago, Ill



Stepped Cutoff Tool Gives Better Results

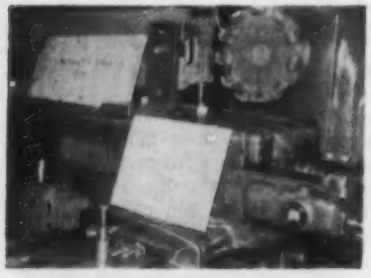
Because we use cutoff tools quite extensively, the knowledge we have gained can be compared with a sizable survey on the subject. But in spite of this, we still have our greatest difficulties with the deeper cutoffs.

However, the tool shown has eliminated some of the causes for this problem. The swedging effect that normally takes place when a chip is forced out through the groove is avoided. The reason for this is that instead of producing a single ribbon-shaped chip, this tool makes two separate chips which easily eject from the groove.

The two cutting edges are produced by first squaring off the tool as usual. With a good square corner of the wheel, a step is ground about 0.025-0.030 in. back from the front edge and nearly half way across. A diamond-dressing wheel is then used to finish the recessed edge and its inside corner which should produce two equally balanced cutting edges.

W E Stengle, Enid, Okla

Practical Ideas...



Setup Photo File

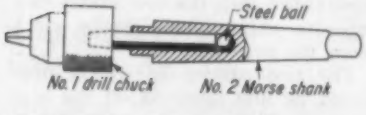
If you have a small shop, you probably have the same trouble that we do—it's hard to remember just exactly how you set up an odd job the last time you had it. You can fuss around and try to duplicate it, but you waste just about the same amount of time you did when you first had the job.

We overcome this lack of perfect memory by taking a photo of each unusual or particularly effective setups with a Polaroid camera, and we keep the photos in a card file for future reference. The illustrated picture is such a photo, which includes important rigging details and dimensions lettered (large) on cardboard signs.

On the back of each photo we note feeds, speeds, depth of cut, cutter size, and so on. Thus we have all the important details, plus graphic illustration of the setup, all on one small card. It eliminates time-consuming drawings and long, windy descriptions.

The card file is also a good thing to go through if we're stuck on a new setup; sometimes we can get an idea from just glancing at other setups, even if they aren't the same kind of work or machine.

H C Haag, Hohokus, NJ



Floating Drill Chuck Aids Small-Hole Drilling

This is a tailstock tool designed to provide close control over the resistance of small drills for use in a H.S. lathe. Its successful operation depends on the skill of the operator to apply his sense of "feel"; something he learns and develops with practice only.

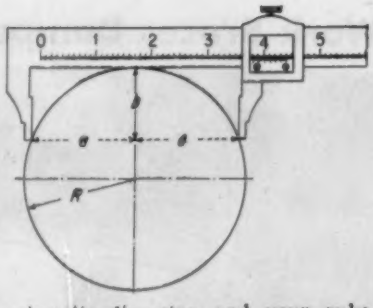
The object is to feed the drill into the work with the tailstock quill, exercising the same care as when using a conventional chuck. Where the floating chuck differs from the conventional is that it is held between the fingers of the left hand, acting as a brake on its periphery, while the quill is operated with the right hand. Thus, the operator is able to feel when the drill becomes overloaded at which time he releases the chuck and backs off the quill to clear chips causing the binding.

A No. 2 Morse shank in good condition is cut off an old drill to serve as holder. Into the end, and concentric with the axis, is ⅜-in. hole drilled and reamed approximately half way through the holder. A straight shank, which is to have a running fit in the holder, is then fitted to a No. 1 drill chuck purchased for the purpose. Before assembling the two members, a bearing ball is dropped into the hole to provide a frictionless thrust seat.

Niels Thomsen, Ferndale, Mich

Calipers Measure Diameters Beyond Normal Capacity

Suppose you had access to any point but the ends of a shaft for measuring its diameter, and your only handy tool a vernier caliper, too small to take a direct reading, what would you do? You would probably lay the calipers aside saying that you can't use them because they're too small and then send for a large-size micrometer, no matter what the cost.



This is not at all necessary if a little mathematics is applied to the reading that can be obtained. Such a reading is taken as illustrated in the sketch. With care, and keeping in mind that the three bearing points must make equal contact, accurate dimensions can be found.

The formula used is as follows:

$$R = \frac{a^2\ b^2}{2b}$$

R = radius, Diameter = 2R
a = half of arc measured
b = throat depth of caliper.

Otto K Grade, Springdale, Conn

Roy Milburn
Coalinga, Calif
Won $25 for his idea:

MILLING FIXTURE SAFELY REMOVES CYLINDER LINERS in the Nov 16, 1959 issue

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning idea is made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

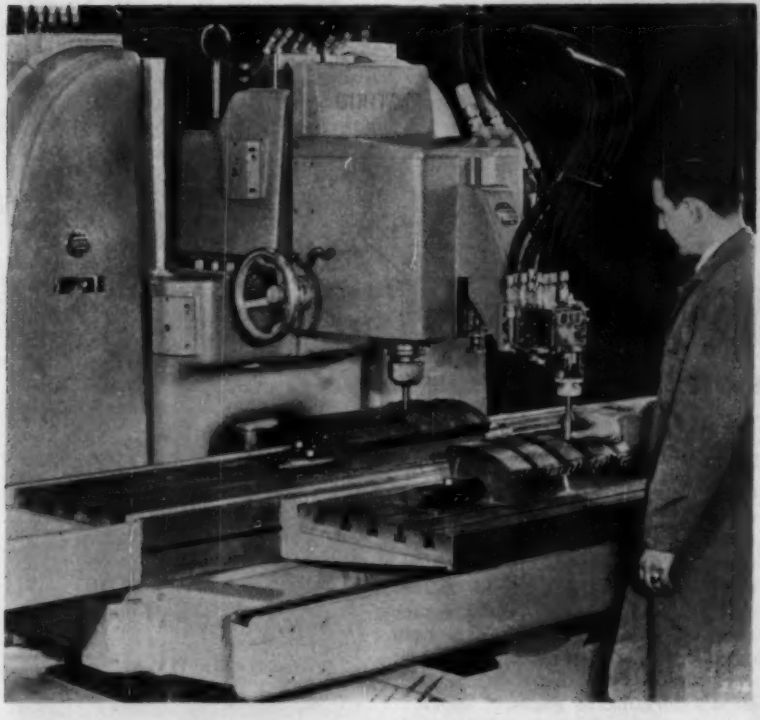
JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc, and those of its advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

New Shop Equipment
Materials and Parts



Gorton Bed Mill Performs Profiling, 3-D Duplicating or Conventional Milling

New Gorton Bedmil, available in 14 models and 34 combinations, performs as a three-dimension duplicator, a production profiler or a conventional milling machine.

It can be equipped with hydraulic, electro-hydraulic (automatic) tracer control or numerical control. Speeds and feeds can be specified as electrical or hydraulic or a combination of electrical and hydraulic.

The Bedmil can be supplied with a hydraulic spindle ranging from 15 to 40 hp. Spindle speeds vary from 215 to 3000 rpm for the 15-hp model to 37 to 3000 rpm for the 40-hp model. Infinitely variable speeds and lower ranges are available at extra cost.

A wide center bearing and outboard bearing rollers support the 84-in. saddle which travels on hardened and ground outboard supports, providing a bearing spread greater than the table travel.

A master table for use with the tracing systems is mounted on the front of the machine and measures 52 x 24 in. All controls are contained in a separate console. A 188-gal divided reservoir and an electric motor are provided for the hydraulic system.

Specifications include: 24 x 84 in. table working surface, 48 in. longitudinal feed, 16 in. cross feed, 24 in. vertical ram movement, 16 in. transverse movement, 32 in. maximum cross range; 6½ to 38 in. range from cutter spindle to table top.

The machine is 120 in. high, occupies a 182 by 121 in. floor space, and weighs 21,000 lbs.

George Gorton Machine Co, Racine Wis

MORE DATA? Circle 51, inside back cover

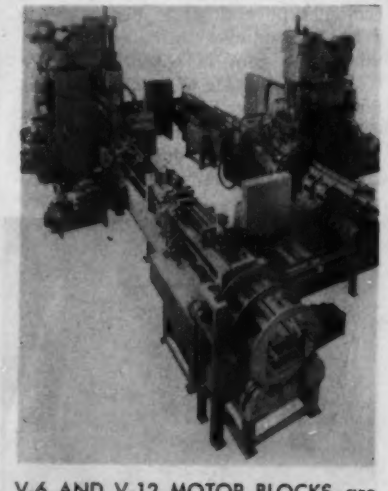
Overhead Transfer System Automates Parts Handling

Transfer process for machining, welding and assembling operations operates overhead, raising the parts above the machines to index them to succeeding stations.

The basic section of the mechanism is a single box-frame supported above the production line by arch type supports. The frame is cylinder powered and rides on flanged guide wheels fixed to the arches. Parts ride on sets of hooks carried by the frame; hook-sets are raised and lowered in unison by individual lift cylinders. Special loading tables are used to receive the parts from the frame and load them into the machines.

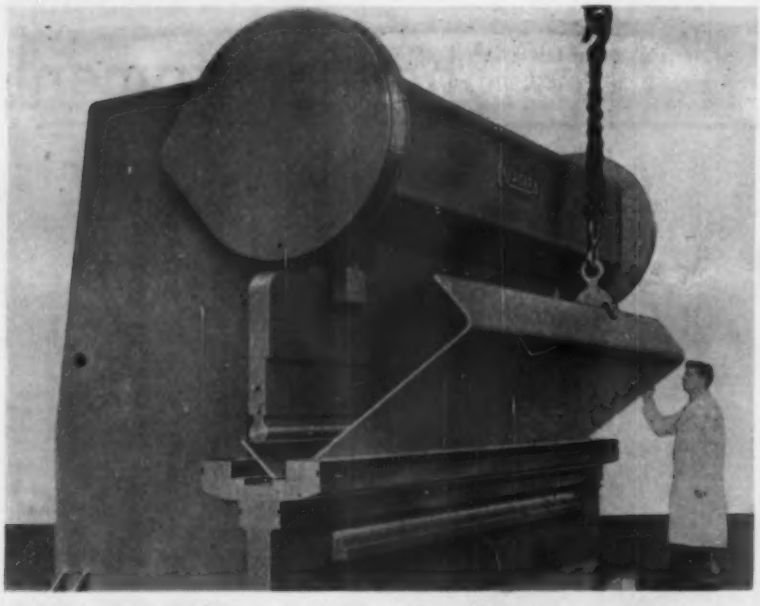
Gear-O-Mation Div, Michigan Tool Co, 7173 McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 52, inside back cover



V-6 AND V-12 MOTOR BLOCKS are automatically honed on new Barnesdril transfer line. One 6-spindle machine hones two V-6 blocks at one time, and 3-spindle machine hones the V-12. Units do not operate simultaneously. Size consistency is maintained within 0.0003 from bore to bore. With stock removal of 0.002 to 0.0035, finish is held at 15 to 25 rms —*Barnes Drill Co, 830 Chestnut St, Rockford, Ill*

MORE DATA? Circle 53, inside back cover



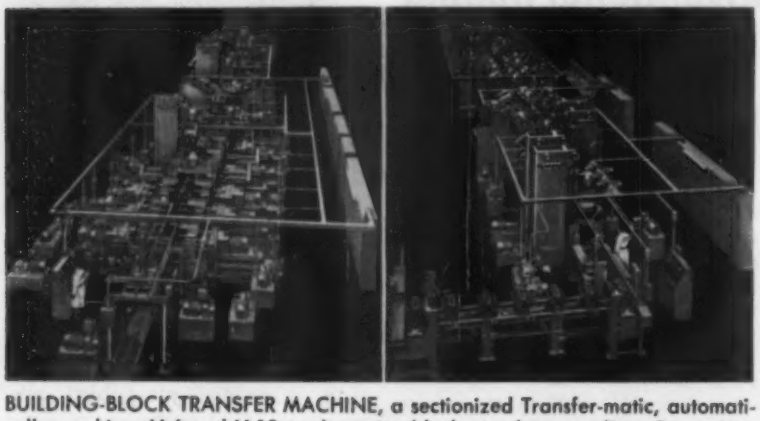
Niagara Enlarges Press Brake Line; Series N Capacities Now 90 Through 1500 Tons

Over-all bed and ram lengths range from 6 to 24 ft; bending capacities are for 12 gage to 1 in. mild steel. Chief design changes include choice of power or manual clutch, brake, and treadle; two-speed transmission; rocker type end guide bearings for precise, endwise alignment even when the ram is tilted for taper work; wide choice of special features and arrangements to meet individual conditions.

Construction is of one-piece welded steel except in the larger sizes where the deep bed, extending below the floor, is removable. Box crown encloses connections and places them closer together for a stiffer ram. Additional features: laminated nonmetallac ways for accurate alignment and long service; convenient power ram adjustment; double end twin drive with double reduction gearing; centralized pressure lubrication: broad selection of gages.

Niagara Machine & Tool Works, Buffalo 11, NY

MORE DATA? Circle 54, inside back cover



BUILDING-BLOCK TRANSFER MACHINE, a sectionized Transfer-matic, automatically machines V-6 and V-12 truck engine blocks on the same line. Operations include boring, reaming, tapping, chamfering, and spotfacing. This 450-ft-long line that includes 82 stations looks like a flattened S; middle leg is a 100-ft-long accumulating conveyor that joins the machining sections. Capacity of the line, at 100% efficiency, is either 65 V-6 blocks per hr or 35 V-12's—Cross Co, Box 3835, Detroit 5, Mich

MORE DATA? Circle 55, inside back cover

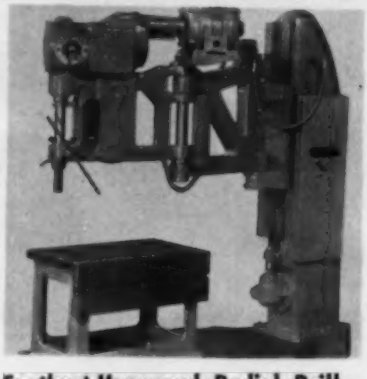
New Bandsaw Blade Contains Vanadium Carbide

Jet Band made from a new alloy steel specially developed for bandsaws contains a high proportion of vanadium carbide which is harder than the aluminum oxide in grinding wheels and twice as hard as carbon bandsaw blades. It is reported to have exceptional cutting power and ability to withstand abrasion, plus high fatigue resistance and flexibility comparable to carbon bands.

On standard machines at regular speeds and feeds, the blade is reported to outlast carbon bands 3 to 1 and cuts a wider variety of materials including stainless steels and high temperature alloys. On high production machines it is said to match the performance of HSS bands, at a saving of 25% in cost.

Millers Falls Co, Greenfield, Mass

MORE DATA? Circle 56, inside back cover



Footburt-Hammond Radial Drill Incorporates New Design Features

Type G sensitive radial drilling machine, with completely new electrical system, has pushbutton station located at the drill head and main electrical enclosure set into the machine column. Jointed arm permits ready placement of the head in relation to the work; time required to move from hole to hole is reduced to a minimum.

Saddle which carries the hinged arm is mounted on the column with an adjustable gib. Vertical travel is provided by a screw and optional motor drive. Arm swings upon stationary trunnion on the saddle with weight carried on ball thrust bearings. Fully counterweighted spindle is provided with hand feed and a 6-speed drive. Vertical adjustment of the saddle is 24 in.; spindle travel is 7 in.; spindle can be moved in a radius from 15 to 50 in. away from the saddle trunnion. On a 60-c installation, spindle speeds are from 95

to 1140 rpm; capacities are 1⅛-in. drill, 1-in. tap in cast iron; 1-in. drill, ⅞-in. tap in steel. Machine is also available arranged for post or wall mounting.

Foote-Burt Co, Cleveland 8, Ohio

MORE DATA? Circle 57, inside back cover

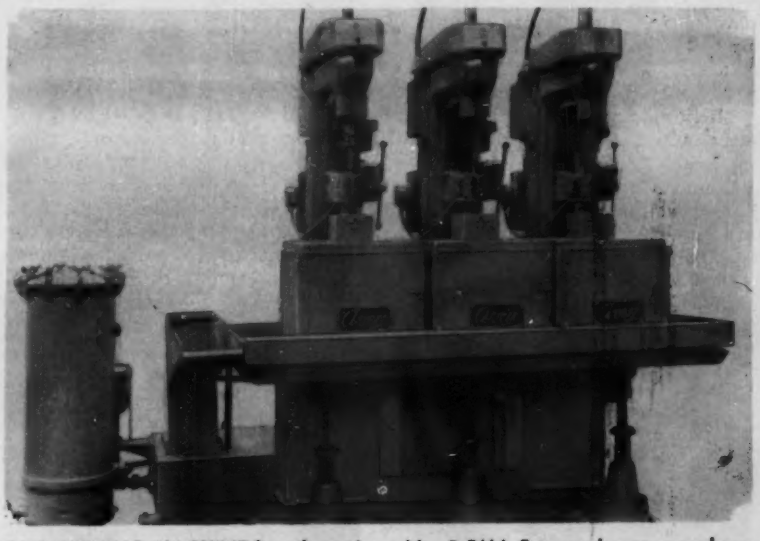
Control Unit Repeats Pattern of Skipped, Punced Press Strokes

Control unit automatically adjusts power press to provide a repetitive pattern of punched and skipped strokes.

Device consists of an actuating cam built into the press slide that is actuated by a double-acting air cylinder. The air cylinder is controlled by a repeating counter which can be set for the required pattern. In operation, the cam adjusts the press slide to the up position. When the set number of skipped strokes have been completed, the cam position is reversed to move the press slide down for the required number of punching strokes. The skip punching device can be disengaged when desired.

Emhart Mfg Co, Hudson Div, Hudson, NY

MORE DATA? Circle 58, inside back cover



GUN DRILLING MACHINE has three Avey No. 2 BMA-5 top columns on a base normally designed for six spindles. Table has 12-in. overhang, 24-in. spindle centers, power feed with fine feed reducers. Spindles have No. 2 or 3 Morse taper with holes drilled through the spindles for high pressure lubrication supply to single lip carbide gun drills. Speeds are up to 8000 rpm—*Avey Division, Match & Merryweather Machinery Co, Cincinnati 1, Ohio*

MORE DATA? Circle 59, inside back cover

18-Ton Kenco Press Has Built-in Safety Features

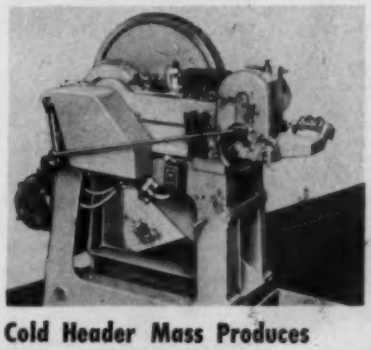
18-ton Electro-Safe press has built-in controls that are readily interlocked with overload detectors or other devices that monitor proper feeding or sense malfunction during operation.

Because the press drive has no clutch or flywheel, the press may be stopped or started at any point in the stroke. To single-trip the press, the operator must press and hold to the bottom of the stroke two widely-spaced buttons. A key-locked selector switch, which may be set to continuous, single-trip or inch, prevents tampering with the setting.

The Electro-Safe press, also available in 5, 8, 12 and 15-ton capacities, is designed for use in high-speed automatic setups and in multiple units for punching, forming, blanking or bending of long extruded shapes. A full range of shut heights and stroke lengths is offered.

Kenco Mfg Co, 5211 Telegraph Rd, Los Angeles 22, California

MORE DATA? Circle 60, inside back cover



Cold Header Mass Produces Long Thin Parts

Morris-Omega Special "0" is designed for mass production of long thin pins, lead wires, and similar parts. Machine, reported to be the first of its kind in this country, can handle wire from 0.020 to 0.090 in. in diameter and produce headed parts to 2-3/8 in. in length. Unit which measures 41 x 20 x 40 in. high is equipped with 1-1/2-hp motor drive and is capable of producing a wide range of parts from 60 to 100 pieces per minute.

Standard features include fitted hardened steel sliding members and many critical components of solid bronze; easily accessible provision for fine adjustment of stroke, tool setting, feed and cutoff; shear pins at critical points to prevent tool damage; and one-shot lubrication system.

REM Sales Inc, Robert E Morris Co, West Hartford 7, Conn

MORE DATA? Circle 61, inside back cover

Adjustable Speed Wet Grinder Uses 36 x 4-in. Wheel

Model 61 AVSW can be used for grinding high speed toolbits and for sharpening form dies for blanking out a variety of shapes in fiberboard,

plastics, foil, and similar materials. Up to 20 hp can be furnished for the 36 x 4-in. wheel which offers almost a flat surface for grinding.

Maximum peripheral speed for either vitrified or high speed grinding wheels can be maintained for the entire life of the wheel. Adjustable wheel guard and speed changer are interlocked to prevent overspeeding of the wheel.

US Electrical Tool Co, 3640 Llewellyn St, Cincinnati 23, Ohio

MORE DATA? Circle 62, inside back cover

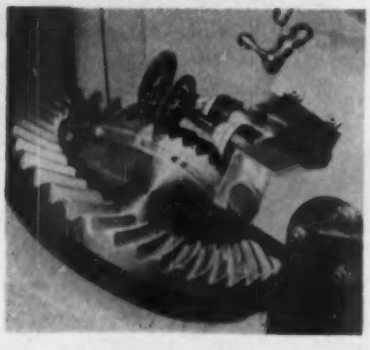
Wet Blast Unit Can Be Operated From Sitting Position

Consol-Matic, specially designed for high production rate finishing of small parts, has two bays at the operating station where work is loaded and unloaded. Moving blast guns, driven by air cylinders, are positioned at each bay. Operator places parts in either or both bays and depresses foot lever which begins movement and activation of the blast guns. Pre-set timer determines length of blast time as well as speed of gun oscillation. Design of the bays permits use of masks if decorative effects are required. Positioning devices are provided for blast finishing of parts such as sparkplugs or vacuum tube leads.

Unit operates on the aspiration system which eliminates need for a pumping mechanism in the blast circuit. Employing fine abrasives (up to 5000 mesh), it reportedly imparts fine satin, chemically clean surfaces without heavy etching, stock removal, or distortion. Dimensions are 46 in. high, 24 in. wide, 34 in. deep, weight is 130 lb.

Pressure Blast Mfg Co, Manchester, Conn

MORE DATA? Circle 63, inside back cover



Grinder Deburrs and Chamfers Both Ends of Gear Teeth Simultaneously

Twin-spindle automatic high speed grinder simultaneously deburrs and chamfers entire contour of both ends of the teeth on spur, helical, or bevel gears. Reinforced wheels are driven at 17,000 rpm with standard air spindles. Standard machine will handle gears from 3 to 13 in. OD; other models are available for 20 in. OD.

After wheel spindles are started, gear is placed on the fixture, and two buttons start the machine cycle. Fixture starts rotating and tilts upward. Grinding wheel spindles lower to contact the work, and deburring starts. After a preset number of rotations of the gear, during which the grinding wheels rise and fall to follow the contour of the heel and toe, the spindles are raised, fixture is lowered to unload position, and fixture rotation is stopped, all automatically. Amount of material removed is determined by pressure of the grinding wheels, regulated by an adjustable counterweight on each spindle, and the number of rotations of the gear.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 64, inside back cover

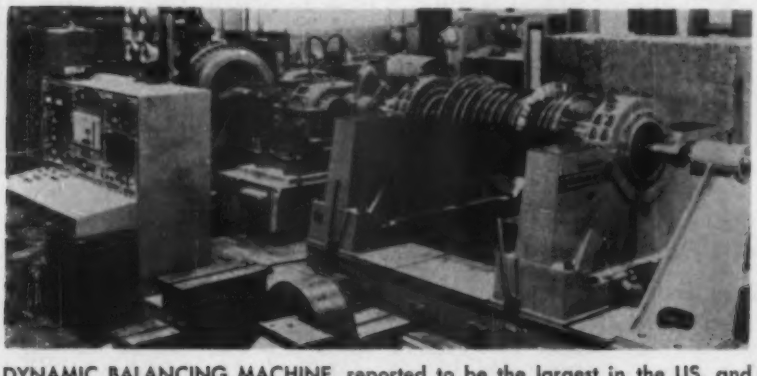
Compact Ultrasonic Degreaser Offered in Self-Contained Unit

Model AC-25 Sonogen, enclosed in a stainless steel cabinet, removes chips and soils from intricate parts. Components such as small motors, electronic subassemblies and bearings can be cleaned without dismantling. After immersion in the tank, work is spray-rinsed by hand, placed in the vapor zone, then removed from the unit, clean and dry.

Unit, which measures 44 x 18 x 36 in., does not require separate generators, cleaning chambers, or rinsing tanks. Only water and 110-v 60-c electrical connections are needed. There are five main components: a 10 x 8 x 8-in. deep ultrasonic cleaning tank; a boiling sump; an ultrasonic generator producing 40,000 cps; transducers (in tank) that convert electrical energy into mechanical vibrations; and a system to recirculate filtered solvent.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn

MORE DATA? Circle 66, inside back cover



DYNAMIC BALANCING MACHINE, reported to be the largest in the US, and built by Schenck of Germany for installation at De Laval, is capable of balancing 7-ton rotating units at 12,000 rpm. Machine is sensitive to bearing vibrations of the order of 4 millionths of an inch displacement of center of gravity. It can detect, on a 5500-lb rotor spinning at 4000 rpm, unbalance as small as one gram at a 10-in. distance from the axis of rotation—*De Laval Steam Turbine Co, Trenton, NJ*

MORE DATA? Circle 65, inside back cover

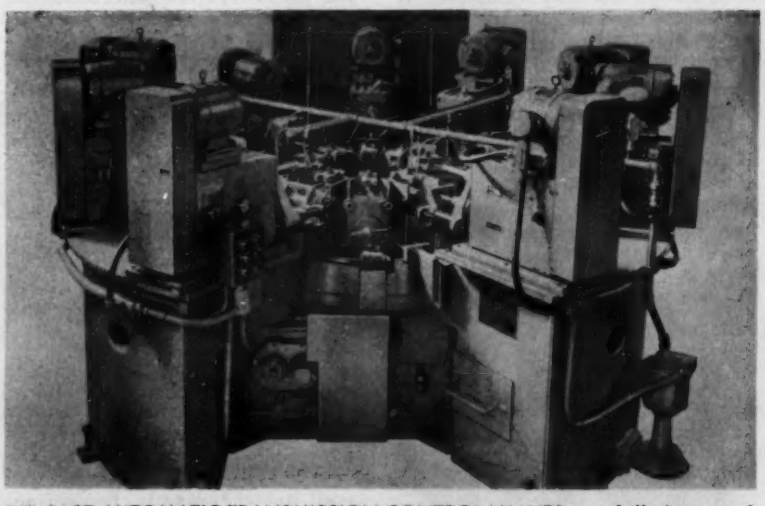
Fluid Coats Painted Surface, Keeps It Dirt and Dust-Free

Du Pont Soil Retardant Concentrate, developed for industrial maintenance, is a water-like fluid that is reported to make a smooth paint surface so slick that dust and dirt cannot cling to it. Microscopic pores of an apparently smooth surface are filled to produce a slickness so total that there is virtually nothing for dirt to adhere to.

Based on a colloidal silica, the material is mixed one part with 14 parts water and can be sprayed, brushed, roller-coated, mopped, or wiped on a clean interior or exterior painted surface. The thinner the film, the more efficient the performance. Within 15 minutes a hard, transparent coating has formed that sheds dust and dirt particles deposited from the atmosphere. Smudges remove with ease. A penny's worth will coat 4 sq ft.

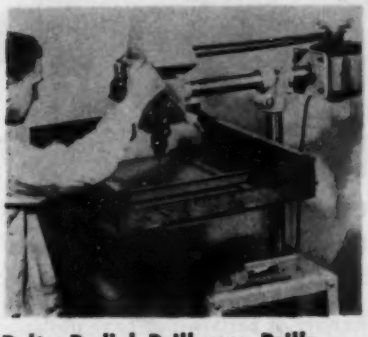
E I du Pont de Nemours & Co, Finishes Div, Wilmington, Del

MORE DATA? Circle 67, inside back cover



DIE-CAST AUTOMATIC TRANSMISSION CONTROL VALVES are drilled, reamed, and tapped automatically by new high production machine Model HRT-274. Horizontal rotary indexing machine uses a 36-in.-dia table and a 10-station automatic hydraulic index to process 188 pieces per hr at max rate. Nine auxiliary units are mounted on platen; eight are horizontal drilling units and the ninth is a horizontal tapping unit—*Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati 2, Ohio*

MORE DATA? Circle 68, inside back cover



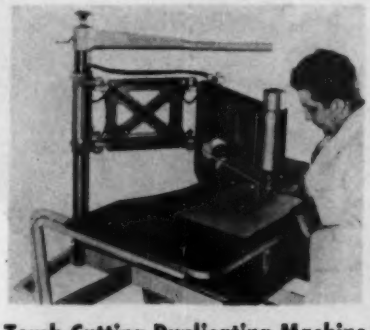
Delta Radial Drillpress Drills To Center of 32-in. Square

Designed for rapid multiple drilling operations, horizontal and angular drilling, machine is capable of doing accurate sanding, shaping, routing, mortising, plug cutting, and similar operations. Head swivels 360° around the column and tilts more than 90° to the right and left. Work always remains parallel with the base.

Features include choice of four speeds, 700, 1250, 2400, and 4700 rpm, for drilling a variety of materials; degree-calibrated scale that assures accurate setting of head for angular drilling; built-in stop which functions throughout full ram travel simplifies resetting of the head to a vertical drilling position; a 3/4 x 23-3/4 x 15-7/8-in. table, adjustable through 360°, provides proper work support even for horizontal drilling operations; table is mounted to a fully machined 8-1/2 x 9-in. cast iron table for extra precision drilling operations. Price, without motor, is $89.50.

Rockwell Mfg Co, Delta Power Tool Div, 465 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 69, inside back cover



Torch Cutting Duplicating Machine Makes Single or Batch Cuts

Machine employs four methods of operation: cutting to sheet metal templet; cutting direct from drawing; circular cutting; straight cuts in desired direction. It can be used for cutting any shape sections from iron plate 0.118 to 4-in. thickness, and saves setup time since it makes use of existing drawings, templets, or automatic attachments.

Jointed arm of the pantograph is supported on adjustable ball bearings which do not require maintenance. Switchboard incorporated in the U-arm includes a table which furnishes all necessary information concerning nozzle size, cutting speed, and oxygen pressure.

Length of cut with templet is 75 in., with guide plate 40 in.; width of cut with templet 29 in., with guide plate 10-1/2 in.; circular cut with templet 7/8 to 28-1/2 in., with compass 3-1/2 to 27-1/2 in.

Milo Mfg Co, 259 N Broad St, Elizabeth, NJ

MORE DATA? Circle 70, inside back cover

Carbon Dioxide Welding Gun Offered for Use on Mild Steel

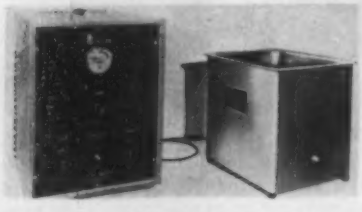
New manual Aircomatic (Air Reduction's gas-shielded metal-arc process) welding gun uses carbon dioxide as a shielding gas. Air-cooled Model AH60-B has a continuous duty rating of 600 amp dc when

using buried arc CO_2 techniques. It can handle hard welding wires ranging from 0.035 through 3/32 in. fed from conventional Airco wire feeders.

Gun is equipped with a lever trigger for simple operation and has a gooseneck nozzle assembly for easy welding in hard-to-reach areas. Number of cable connections has been reduced by combining both the power cables and the wire casing.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

MORE DATA? Circle 71, inside back cover



Ultrasonic Cleaner Designed For Jobs Requiring Medium Power

Standardline Model 140, for use where average ultrasonic energy is required, has a 7-gal heavy-gage polished stainless steel tank 14¾ in. long, 11¾ in. wide, and 10 in. deep. Crystals cover 27.5% of the tank bottom; actual radiating surface is 48 sq in.

The 115-v ac single-phase 60-c generator, designed for continuous operation, delivers an average power output of 250 w and produces peaks of 1000 w. Features include one-tube oscillator, front panel switching which permits a choice of either of two transducers, forced air cooling, and 3-wire ground protection. Unit can be adjusted to available line voltage. Price is $745.

National Ultrasonic Corp, 111 Montgomery Ave, Irvington, NJ

MORE DATA? Circle 72, inside back cover

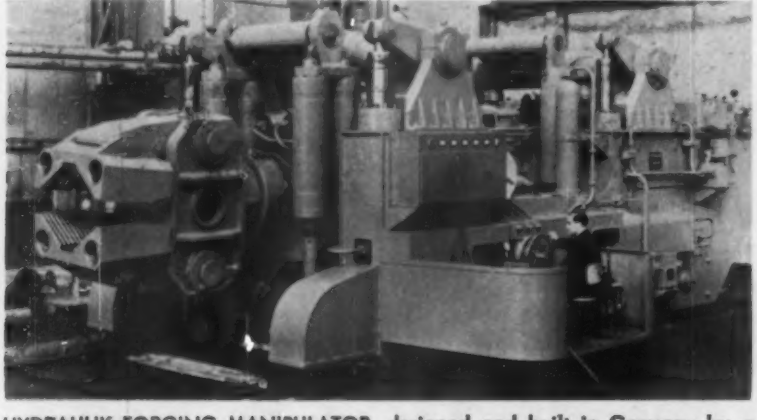
Vacuum Probe and Transducer Aids Small Parts Assembly, Inspection

Bazooka hand-tool permits faster handling and more accurate, efficient control in sub-assembly of delicate, hard-to-manage parts. Vacuum system operates by connection to standard compressed airline.

Very fragile parts can be inspected because vacuum provides an even, uniform pressure which can be adjusted accurately by changing the plastic tips by which parts are held, and by a regulator installed in the airline. Wide range of tips is available to meet requirements of any inspection operation or to perform assembly operations.

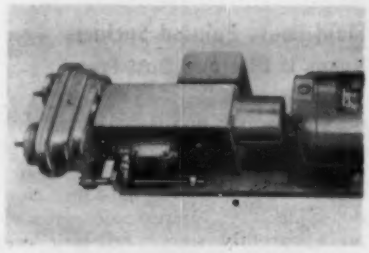
Air-Vac Engrg Co, Old Stratford Rd, PO Box 87, Shelton, Conn

MORE DATA? Circle 73, inside back cover



HYDRAULIK FORGING MANIPULATOR, designed and built in Germany by a DeMag subsidiary, is applicable for either press or hammer forging. Track-mounted, it is water-hydraulic actuated and derives its 1420-psi hydraulic pressure from machine-mounted accumulators that are constantly recharged by electric motor driven pumps. Built in seven capacities ranging from 3 to 110 tons, machines are designed for high-speed operation under most severe shock loading conditions—*Salem-Brosius Inc, PO Box 2222, Pittsburgh 30, Penna*

MORE DATA? Circle 74, inside back cover



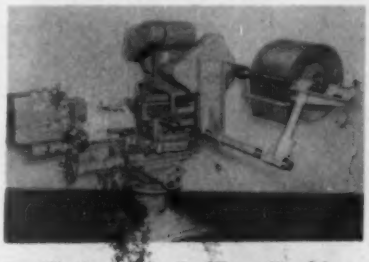
Drill Units Available With Single or Multiple Spindles

New line of hydraulically actuated drill units can be furnished as a single spindle unit or with a multiple spindle head.

The self-contained quill type units have a 600 lb thrust capacity, 4 in. maximum stroke, 0-3000 cycles per hour, and spindle speeds ranging from 1200 rpm. It can be mounted in any position.

John S. Barnes Corp, 315 S Madison St, Rockford, Ill

MORE DATA? Circle 75, inside back cover



Oscillating-Arm Buffing Machine Finishes Irregularly Shaped Parts

Machine provides a method for automatically buffing or polishing a wide variety of parts which have obstructions that prevent complete rotation. It consists basically of an Acme E-10 semi-automatic machine equipped with an air cylinder advance and an oscillating arm fixture. Parts can be mounted on an arbor with a locator and square drive. Arbor and part assembly are then positioned in the arm unit by an air-powered tailstock.

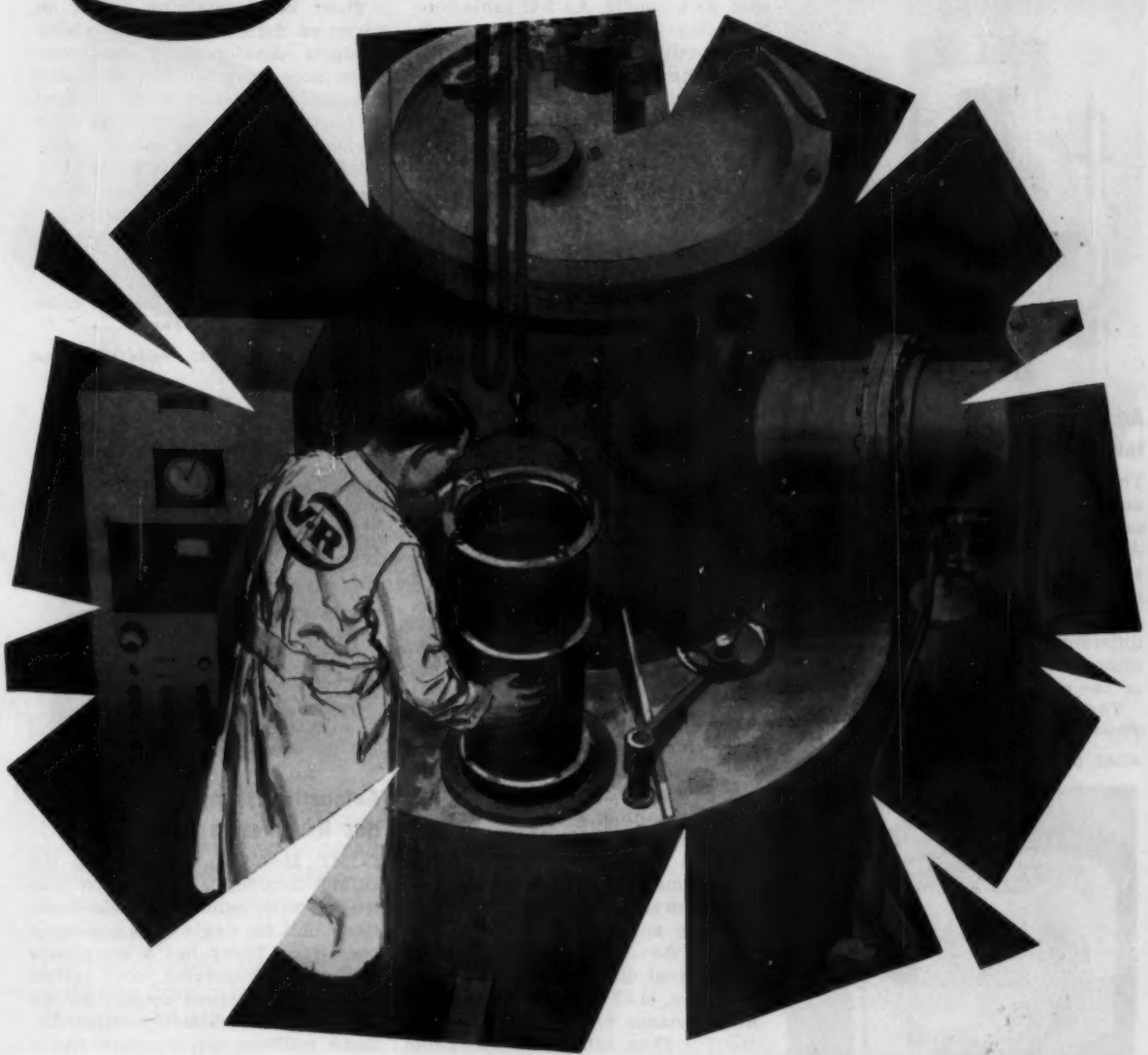
Parts positioned in the arm are advanced by air cylinder control into contact with a buffing wheel mounted on a conventional double-end buffing lathe or an adjustable lathe. Pushbutton initiates a timed sequence of arm oscillation to give the desired wheel contact time. Arm unit can be adjusted to give from zero to 360° of oscillation. Complete unit occupies floor space approx 4 x 5 ft and is 4½ ft high.

Acme Mfg Co, 1400 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 76, inside back cover

V-R

CREATING THE METALS THAT SHAPE THE FUTURE



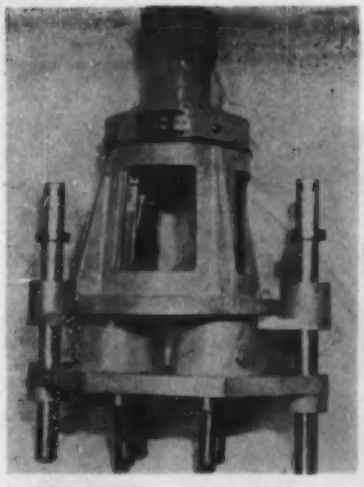
V-R vacuum sintering makes better carbide

Vacuum sintered steel cutting carbide grades are more versatile because precise control during vacuum sintering removes trace impurities . . . increasing the strength of V-R carbides and their ability to withstand cutting conditions which generate extreme heat. Vacuum sintering is one of the many reasons for the superior performance of V-R's new carbide grades for machining all types of steel and the new superalloys. At V-R, the finest in modern equipment is effectively combined with the metallurgical knowledge gained through 30 years of carbide research and manufacturing experience . . . experience that means better carbide for every use.

V-R VASCOLOY-RAMET

824 MARKET STREET • WAUKEGAN, ILLINOIS

C-768



Adjustable Angular Drillhead Introduced by Thriftmaster

This 4-spindle full ball bearing universal joint drillhead taps four holes each at a 4° angle with the vertical. Adjustable feature is a result of a special design adaptation of the recently developed Thriftmaster cartridge spindle construction. Use of a different cartridge plate will permit minor changes of the center distance or the angle of the spindles.

Thriftmaster Products Corp, 1016A N Plum St, Lancaster, Penna

MORE DATA? Circle 77, inside back cover

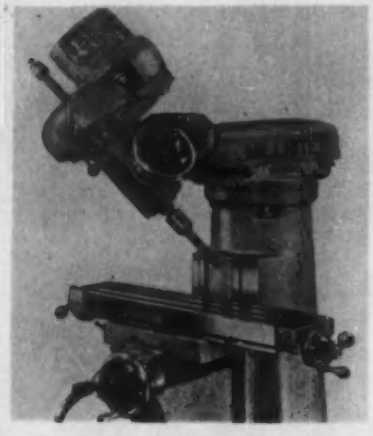
Electronic Force Gage Measures Welding Electrode Pressures

Device measures the pressure exerted by the electrodes of resistance welders. Unit is self-contained, with a transistorized amplifier and its own power supply in the form of two small, replaceable dry-cell batteries. Panel controls are provided for checking the batteries and for calibration, insuring accurate results each time the gage is used.

Batteries, amplifier, controls, and meter are all contained in a 7½-lb case with handle. An 8-ft cable connects the amplifier with a transducer unit which is hand-held between the jaws of the welding machine while the welding current is turned off.

Control Devices Inc, 925 S Eton, Birmingham, Mich

MORE DATA? Circle 78, inside back cover



Compound Swivel Head Increases Range of Vertical Mill

Swivel provides for double angle settings, further increasing the range and capacity of the Millrite, a full-size dovetail ram and turret vertical toolroom milling machine. Recessed mounting of the swivel on the ram overarm minimizes overhang, maintaining machine's balance and rigidity. Protractor scale is provided to facilitate angular settings.

With the compound swivel overarm, throat distance, spindle to column face, is 17 in. max, 6½ in. min; max distance from nose to top of the 7 x 27-in. table is 18 in. Table feeds are: longitudinal 16 in., cross-feed 8 in. There is 15-in. vertical knee travel, with ram movement of 12 in. and quill travel of 4 in. Basic equipment sells for less than $1000.

US Burke Machine Tool Co, Brotherton Rd at Pennsylvania RR, Cincinnati 27, Ohio

MORE DATA? Circle 79, inside back cover

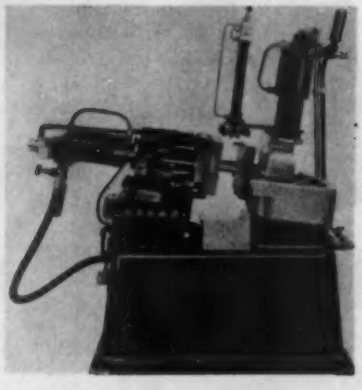
New Alclad Alloys Have High Corrosion Resistance to Hot Water

Group of sheet and plate alloys developed by Alcoa are reported to be outstandingly superior to other metals, including previously available aluminum alloys, in resisting corrosive perforation by hot water. Hot water handling equipment fabricated from conventional materials presents corrosion problems in many areas of the country.

These new aluminum alloys, an advanced form of the first alclad products developed by the company more than 30 years ago, offer strength and resistance to corrosion by combining two or more specially designed alloys in a single fabricated form. Clad surface of the alloy combinations is in itself a corrosion resistant material. In addition, it acts as a built-in anode to provide electro-chemical protection to the core alloys.

Aluminum Co of America, 798 Alcoa Bldg, Pittsburgh 19, Penna

MORE DATA? Circle 80, inside back cover



Automatic-Cycling Die Caster Has New Design Features

DCMT MAC 99, successor to the DCMT Imp/96, is pushbutton controlled, with quick-attach electronic timer unit for single-cycle automatic operation. Timer has a completely new solenoid-operated valve system with two-way speed control for die setting and shockless operation. Exhaust mufflers are standard equipment.

Model has a new four-way adjustable die unit and spacer plate: tie bars placed horizontally and spacer plate removed for center shot; tie bars placed horizontally with spacer plate for below center shot; tie bars placed vertically and spacer plate removed for center shot; tie bars placed vertically with spacer plate for below center shot. Two new safety features are dual micro-switches which replace the die overlock safety, and a sensing device which retracts the toggles instantly if foreign matter should get in between the die faces.

DCMT Sales Corp, Div of British Industries Corp, Fort Washington, NY

MORE DATA? Circle 81, inside back cover

To obtain even radiographic density from edge to edge, the rods were cradled in a block of aluminum.

Radiographs reveal air bubbles in the ceramic rods.

The case of the breaking ceramic rods

THESE RODS support an electronic element in an intricate traveling-wave tube. They must withstand high temperatures—high vacuum.

Unaccountably, in the early development of traveling-wave tubes, some rods would break. Also some tubes were difficult to pump down to high vacuum.

To find the reasons, Sperry Gyroscope Company turned to radiography.

The radiographer employed a filter device to obtain even density from edge to edge of the radiographic image of the rods. The defective rods were found to contain tiny air bubbles which expanded when the tube was heated and caused the breakage. They also were the cause of the difficulty in degassing the tubes.

In the inspection of assemblies, of castings, of welds, radiography provides a reliable means of examining internal conditions and making sure that only high-quality products are delivered. Often it suggests ways of improving manufacturing methods and cutting costs.

Would you like to learn how radiography can work profitably for you? Talk it over with an x-ray dealer or write for a Kodak technical representative to call.

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- ... Speeds up radiographic examinations.
- ... Gives high radiographic contrast, increased detail and easy readability at all energy ranges.
- ... Provides excellent uniformity.
- ... Reduces the possibility of pressure desensitization under shop conditions.

X-ray Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Kodak

Abrasive Belt Head Handles Convex and Concave Surfaces

Head is designed for grinding and polishing surfaces of aluminum, brass, and steel castings. Positive belt control at heavy work pressure is provided by a special air-operated scanning eye which prevents belt run-off. As a result, a heavier cut may be taken and fewer passes are necessary. Machine's rigid construction and formed contact wheel enable closer tolerance and truer shape on the finished product. As the abrasive belt oscillates, tension-take-up is air-controlled. Contact roll is supported by an outboard bearing arm and an ammeter is provided to show work effort. Continuous chain reciprocates the platen-mounted fixture.

Murray-Way Corp PO Box 180, Birmingham, Mich

MORE DATA? Circle 82, inside back cover

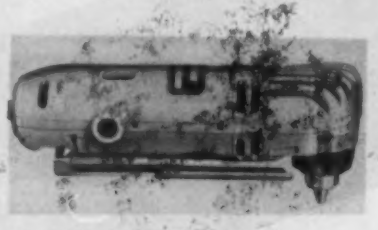
Automatic Finishing Machine Handles Tubular Shapes

Automatic polishing and buffing machine that finishes round, square, hexagonal or octagonal tubular metal parts can also be used for automatic deburring operations on tubular-shaped parts or parts having holes that permit them to be chucked on a mandrel. Buffing wheels, abrasive belts, setup wheels, or wire brushes can be applied on the machine to perform the desired type of operation.

Machine consists of a motorized head, reciprocating work table, and a cam-operated index mechanism for a group of mandrel assemblies mounted on the table. It can be made either as a unit or one having separate reciprocating table and adjustable head units. Standard models have a maximum table travel of 48 in. Parts up to 42 in. long can be handled. Up to eight mandrels can be mounted on the reciprocating table, depending upon the diameter of the work to be finished. Unit occupies a floor space, including table clearance allowance, of about 9 x 4 ft. It is approximately 6 ft high over-all.

Acme Mfg Co, 1400 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 83, inside back cover



New Shorty Drill Has More Power, Less Weight

New ¼-in. Shorty incorporates a 60% increase in power and a 15% reduction in weight. Offset design of the chuck head simplifies working in confined space and around corners and permits finger clearance on flush drilling jobs. Tool is equipped with a full-length paddle switch which enables operator to maintain positive start and stop control in any gripping position. Twin-fan cooling assures lower housing temperatures.

Capacity is up to ¼ in. in steel and ½ in. in hardwood. Speed under full load is 1000 rpm. Unit is equipped with a B&D-built universal motor for 115 or 220 v. Price is $55.50.

Black & Decker Mfg Co, Towson 4, Md

MORE DATA? Circle 84, inside back cover

Automatic Billet Descaler Has Separate, Portable Power Unit

Water power unit which can be mounted remotely from the descaling cabinet in any convenient location is fastened to the hydraulic unit in a vertical position to reduce required floor space. Descaling cabinet has an adjustable billet ejection speed, and the ejecton chamber is arranged to handle a variety of sizes and shapes of billets. Spray is arranged to descale both ends of the billet during ejection.

Scale basket can be removed with a fork truck, or the complete descaling unit can be picked up by the truck and moved to another location. Billet sizes range from 3 to 5 in. rounds 3 to 10 in. long, and from 2¼ to 7 in. round cornered squares 5 to 8 in. long. Automatic operation of the descaler is triggered by entry of the billet into the descaling cabinet. Max water consumption during full stroke is ½ gal; less water is utilized if stroke is shortened. Power unit can be arranged to make use of city water pressure, or a recirculating system can be installed.

American Steel Foundries, Elmes Engrg Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio

MORE DATA? Circle 85, inside back cover

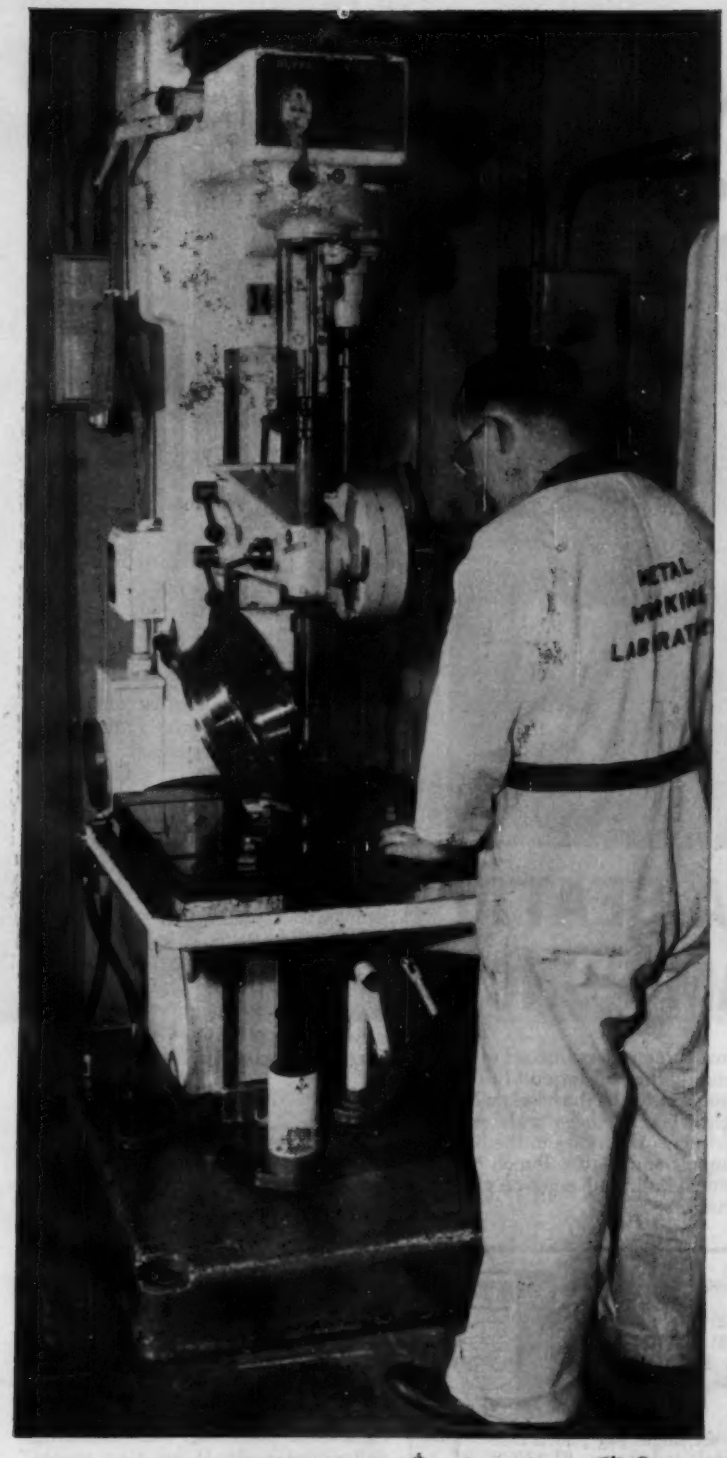
Vibrating Test Machine Designed for Production Lines

Type 400-U-SP is a quality control unit for vibrating assembled products as they come from the production lines to determine errors in assembly. Machine operates at a fixed displacement of ⅛ in. in the speed range of 420 to 1200 rpm. Speed can be adjusted to increase or decrease severity of shocks delivered to the test object. Vibrations will dislodge solder splatters, separate poor electrical connections, and detect improperly tightened fasteners.

Machine, mounted on four retractible casters, has base dimensions of 38½ x 39 in. with over-all height of 20⅝ in.; table measures 36 x 54 in. Load capacity is 400 lbs with a 1/16-in. amplitude and total excursion of ⅛ in. Frequency range is 7 to 20 cycles per second and 420 to 1200 rpm. Standard equipment includes variable speed drive, continuously indicating ac tachometer with 0-1500 rpm range, interval timer, and timer by-pass switch. It is powered by a 1-hp 1750-rpm motor.

L A B Corp, PO Box 278, Skaneateles, NY

MORE DATA? Circle 86, inside back cover



DRILLING HIGH TEMPERATURE ALLOYS WITH THE "BUFFALO" RPMSTER

In 1953, this "Buffalo" RPMster was installed in General Electric Company Jet Engine Department's Metal Working Laboratory. Since that time it has operated for thousands of hours, drilling high temperature alloys such as A-286, U-500, Rene-41, M-252, L-605, X-40, chrom-alloy and many other difficult materials.

In conjunction with dynamometers to record drill thrust and torque, many drilling problems have been solved. The "Buffalo" RPMster was ideally suited to this job because of its instantly available range of speeds from 90 to 3000 RPM and rigid construction. While General Electric uses the drill for testing purposes, new improvements make the "Buffalo" RPMster even more desirable as a production or special application drilling machine. A new torque controlled power feed prevents damage to machine and tool being used and capacities up to 2" are now offered. Of special interest to companies drilling super-hard materials is the modified RPMster supplied with balanced hollow spindle, forced coolant system having a pump with a capacity to 100 psi, special splash guards and rubber-flex collet chuck. This machine is designed to operate with the new hollow core "cold point" drill, and diamond impregnated bits. "Buffalo" hollow spindle drills are available for speeds up to 10,000 RPM.

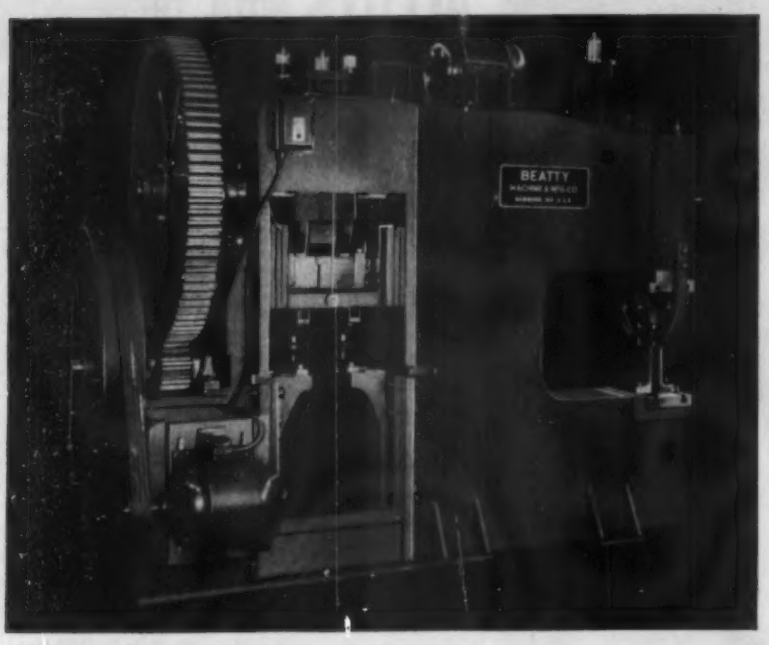
For further information on the "Buffalo" Variable Speed RPMster, contact your machine tool dealer or write direct for details.

BUFFALO FORGE COMPANY ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A. **509 BROADWAY • BUFFALO, N. Y.**

CANADIAN BLOWER & FORGE CO., LTD., KITCHENER, ONTARIO

DRILLING • PUNCHING • SHEARING • BENDING

When Will ONE Machine Do The Work of THREE?



WHEN IT'S A BEATTY DETAIL BEAM PUNCH

Here's a real cost-saver that punches I-beams in just three passes instead of the usual five, and further speeds production by eliminating the end-for-end turning of beams. Many shops require three ordinary machines to do the work which can be handled by one Beatty Detail Beam Punch. This punch not only saves floor space, but also reduces your equipment investment. High dies in the open throat portion punch webs of beams, angles, channels and plates. Punch tools in overhanging bolsters in the guillotine portion punch holes in flanges on either side of the webs of beams. Write for complete details.

SPECIFICATIONS — No. 7 Detail Beam Punch. Capacity: 100-tons or punching 1¼" hole through 1" mild steel.
WEB PUNCH END: Face of Ram, 6" x 18" — Face of Table, 6" x 18" — Distance ram to table, stroke up, 21⅝" — Length of Stroke, 1⅝" — Depth of Throat, 30". FLANGE PUNCH END: Opening through frame, 26" — Length of stroke, 2" — Distance ram to table, stroke up, 12".

TOOL EQUIPMENT: WEB PUNCH END — One set single gag punch tools for punching plates, angles, webs of beams, channels and shapes. FLANGE PUNCH END — Two sets of single gag punch units suitable for punching flanges of beams and channel sections.

Punch units for both ends are of the drop stem type for locating the punch in proper position.

ONE OF THE BEATTY FAMILY OF METAL WORKING EQUIPMENT: Shears, Punches, Presses, Spacing Tables, Bulldozers, Stamping Trimmers

BEATTY MACHINE & MFG. CO.
948 150th St., Hammond, Indiana

Lincoln Electric Offers New 180-amp Welder

Dial control provides easy positive setting of the welder output over a wide amperage range. Electrodes from the smallest to 3/16-in. size can be used to weld materials from 20 gage to 1/2 in. or thicker plate. New design is reported to have unusually stable arc characteristics and will weld mild steel, low alloy steel, and 18-8 type stainless steels.

Operation on 220-v single-phase power supply combined with compact, lightweight construction permits easy movement of the welder to the job when necessary. Voltage input adjustment insures full output performance under all power supply conditions. Price, approximately $145, includes cables, headshield, electrode holder, ground clamp, and power input connections.

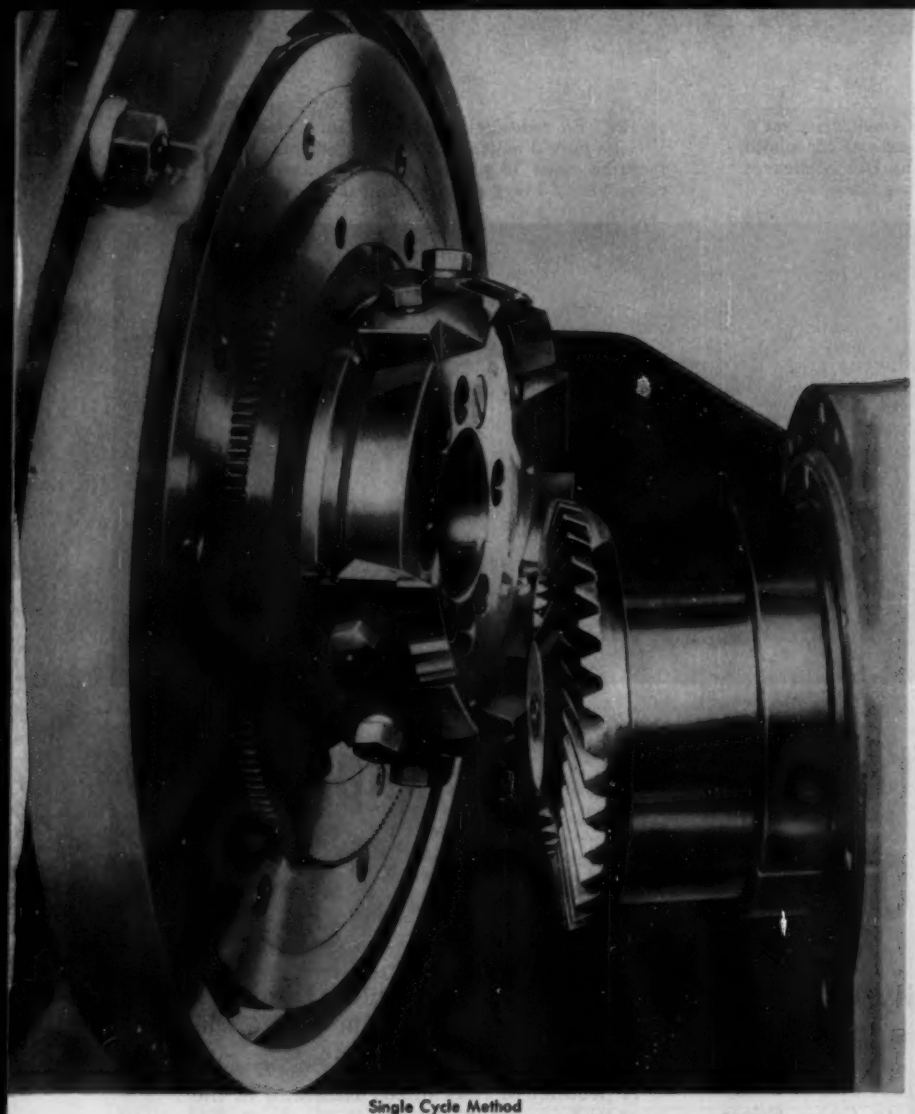
Lincoln Electric Co, Cleveland, Ohio

MORE DATA? Circle 87, inside back cover

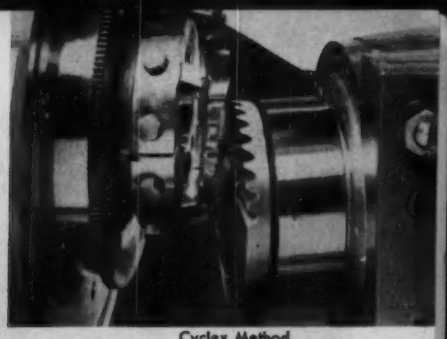
New Air Die Grinder Delivers 0 to 25,000 Controllable rpm

Model 1600 has a metering trigger that delivers 0 to 25,000 controllable rpm allowing operator to throttle down for feather edging. Unit is designed for polishing, wire brushing, and metal removal on dies, stampings, gear teeth, plastics, tubes, castings, and weldments. Grinder takes standard rotary files, standard or carbide wheels, wire brushes, mounted points, and sanding drums.

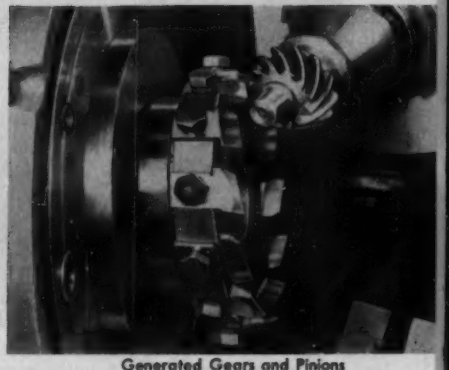
Wheel capacity is 1-1/4-in. vitrified and 1-1/2-in. organic. Three-blade motor is encased in a one-piece aluminum impact housing. Air consumption of 6 cfm at 90 psi is half



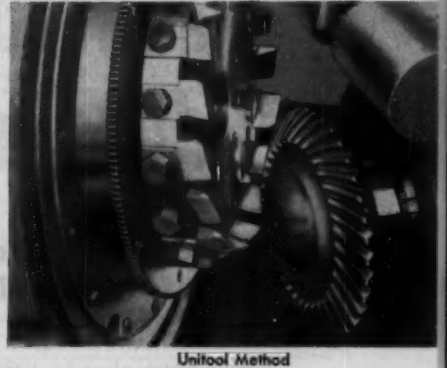
Single Cycle Method



Cyclex Method



Generated Gears and Pinions



Unitool Method

Cut gears with *four* different methods on *one* machine

If you expect your gear needs to change over the years you'll appreciate the exceptional versatility of the Gleason No. 108 Hypoid Generator. With this one machine you can cut both gears and pinions by four different methods:

Single Cycle® Method. Using this method you can cut nongenerated gears four to five times faster than previously possible on machines of this type. Cradle and work head are locked in position. The last rotation of the Single Cycle Cutter finishes both sides of a tooth space. You cut the mating pinions on the same machine using the conventional single-roll Generating Method.

Cyclex® Method. For certain applications you can use the extremely fast Cyclex Method on the No. 108 Generator. You cut nongenerated gears in one completing operation from the solid blank.

Generated Gears and Pinions. You can produce both gears and pinions on this machine with the Generating Method. Here, a relative rolling motion takes place between gear or pinion and the rotating cutter.

Unitool® Method. If you want to cut small quantities of spiral bevel, Zerol® bevel, or hypoid gears with a minimum of tooling, you can use the Unitool Method. You cut both gears and pinions with a single cutter. This method is particularly useful for experimental gears for prototype work.

The No. 108 Generator cuts gears up to 8½" diameter at a 10:1 ratio and to a maximum of 4 DP. You can get the same versatility in cutting larger gears with the No. 118 Hypoid Generator which handles gears up to 18" diameter, 10:1 ratio, to a maximum of 2 DP. A third model, the No. 28 Hypoid Generator, cuts gears up to 33" diameter at 10:1 ratio, 1½ DP.

Send for free bulletins on all three machines.

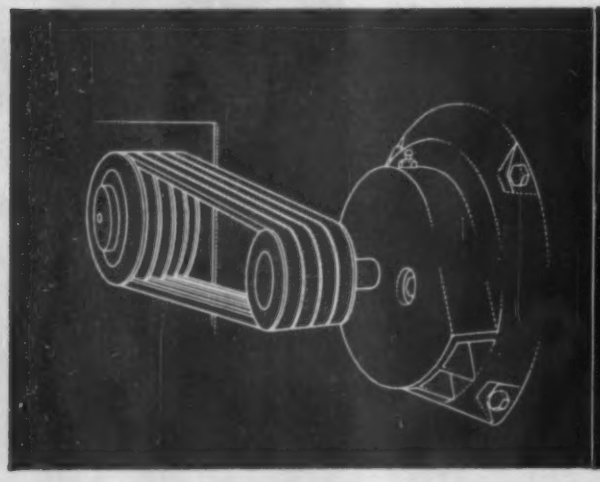
®Trademark

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

BEFORE: This drawing of the former 4-belt drive on a clothes pressing unit is in the same scale as the photo of new Super HC V-Belt Drive at right. Heavy sheaves needed for 4 belts imposed high bearing loads.

AFTER: By redesigning the drive for Gates Super HC V-Belts only 3 belts are required and this Utah manufacturer saves 16 pounds in weight and 24% on the drive cost of every pressing unit it makes.



Manufacturer of pressing equipment cuts cost of drives 24%

New high capacity V-belt also saves weight and space!

This manufacturer is just one of many who have already turned to Gates Super HC V-Belts to achieve far more compact, lighter weight, lower cost V-belt drives for all types of machines. With new Super HC V-Belts, sheave dimensions can be reduced 30% to 50%, overall space up to 50%, and drive weight by 20% and more.

A product of Specialized Research in the world's largest V-belt laboratories at Gates, the Super HC V-Belt Drive is already standard equipment on production models in virtually every industry.

Engineering Service Nation-Wide

Whatever your plant's power transmission design problem, wherever you are, your nearby Gates Distributor or Field Representative is ready to assist you to cut space, weight, and costs with Super HC. Ask him for a copy of *"The Modern Way to Design Multiple V-Belt Drives."*

TPA 463

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

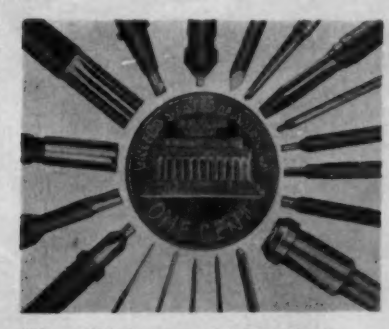
Gates *World's Largest Maker of V-Belts*

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

that of conventional units. Weight is 15 oz, length 6 in. It is furnished with two collets, a 1/4-in. machined on the shaft for minimum runout and a 1/8-in. that slips into 1/4-in. collet body. Price is $89.50.

Superior Pneumatic & Mfg Inc, 13800 Enterprise Ave, Cleveland 35, Ohio

MORE DATA? Circle 88, inside back cover



Micro-Miniature Cutting Tools Offered by Waltham to Industry

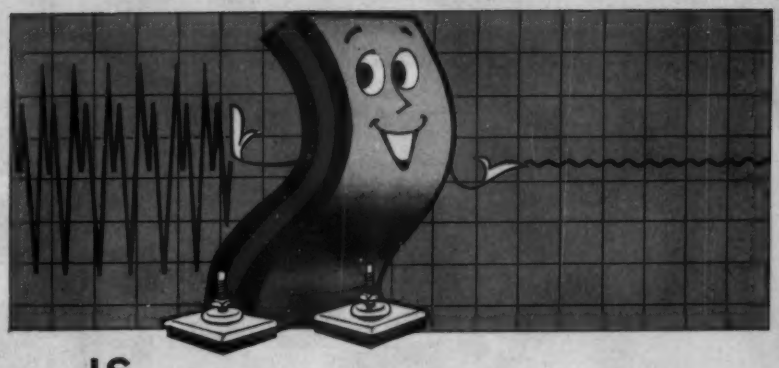
Complete line, made by the company for its own use for over a century, is now available to industry.

As typified by the line of taps which go down in size to 0.012 in. dia with 338 tpi, the tools will be of particular value to manufacturers of precision products and in fields where miniaturization of equipment and components is essential. Other tools in the line include spotters, drills, reamers, broaches, countersinks, counterbores, dies, hollow end mills, face mills, lip mills, routing cutters, keyway cutters, fly cutters, poising and circular saws.

Waltham Precision Instrument Co, Small Tools Div, 221 Crescent St, Waltham 54, Mass

MORE DATA? Circle 89, inside back cover

"First you wanted the afternoon off. Then you wanted a raise. Now what do you want?"



IS

VIBRATION

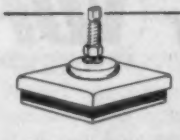
ROBBING YOU BLIND?

Transmitted vibration in your plant or office is a universal culprit that keeps attacking your costs and operating efficiency in a hundred ways . . . unless checked at its source.

Unisorb machine mounts — either pads or Level-Rite devices — reduce up to 85% of this transmitted vibration and provide a practical, low-cost solution to almost all vibration problems. Unisorb Vibration Control reduces noise, worker fatigue and human inefficiency. Unisorb will reduce maintenance of buildings and machines, cut down-time and simplify machine installation. In addition, tests show that Unisorb permits running machines at higher speeds and closer tolerances for increased production and improved quality.

Unisorb Mounting Pads
Unisorb pads are the basic vibration control unit, identified by the red centers and brand mark. Available in a wide range of densities and thicknesses for proper application. Saves up to 80% in installation time and costs.

Unisorb Level-Rite 200
Unisorb Level-Rite "Junior" has been especially designed for light machines, air conditioners, business machines and similar equipment. A low cost, precision leveling device and vibration control unit, with loading limit of 200 lbs. per unit. Ideal for original equipment.



Unisorb Level-Rite Mount
Unisorb Level-Rite is a universal, self-contained leveling device for all types of machines. Fast, simplified way to achieve and hold precise level. Available with exclusive screw-post design or as a basic mounting plate for use with built-in leveling devices.

Remember — to simplify installation, improve performance and control vibration . . .

UNISORB MOUNTS MAKE THE DIFFERENCE

. . . for all types of machines from laboratory equipment to giant presses.
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- Wide, deep and diagonally braced bed ways for maximum rigidity under heavy cuts. *Bed ways induction hardened and ground.* Built-in oil pumps supply force-feed lubrication to headstock, apron and gear box.

- Anti-friction bearings in headstock and gear box—all headstock gears hardened and ground. *Totally enclosed, quick-change gear box* is dial type—cuts standard U.S.S. and metric threads without transposing gears. Headstock has Camlock spindle nose and electro magnetic spindle brake.

- Heavy duty box-type apron with single-lever longitudinal and cross-feed control has *patented drop worm drive* that automatically trips feed when turning against dead stops. Multi-disc forward and reverse clutch can be controlled from the apron—and the headstock.

- Wide range of models—from 14-inch to 81-inch swing. *English screws and dials* are standard. Gap bed and bridge available.

VDF lathes, known the world over for superb quality and craftsmanship, are backed by complete engineering and service facilities. For more information write for Bulletin 127/1e.

VDF Lathe Division of **Rudel Machinery Co., Inc.**

165 MILL LANE, MOUNTAINSIDE, N. J.

CIRCLE 255 READER SERVICE CARD

FIELD REPORT...

Hydrofoil Test Vessel Ordered by US Government

A $1.5 million contract has been awarded to Dynamic Developments Inc for design and construction of an ocean-going hydrofoil ship capable of transporting 100 passengers twice as fast as the speediest ocean liner. Dynamic is an affiliate of Grumman Aircraft Engineering Corp of Bethpage, LI, and the ship will be built there. The companies have been making studies of hydrofoils for the government over the past two years.

The vessels use some principles of powered flight. Wing-like pieces fixed on struts below the hull lift the hull out of the water to reduce wave drag when the craft is in motion; ship then rides on the foils. Specifications for the first model to be built by the companies call for an all-aluminum ship 104 ft long powered by a combination of an aircraft jet engine and a gas turbine. It'll have a speed of 69 to 92 mph, will displace 80 tons, and have a range of 700 nautical miles. Maritime Administration's development program is aimed at testing the practicality of hydrofoils in the 500 to 1000 ton range for high-speed ocean transportation.

Rohr Expands Honeycomb Facilities

Rohr Aircraft Corp, San Diego, is enlarging its stainless steel honeycomb panel manufacturing facilities from 23,500 to 31,250 ft. Expansion and installation of new equipment is designed to double capacity to produce stainless steel structures. Program includes construction of permanent electric blanket brazing facilities that'll permit brazing of larger panels or more complex panel configurations without appreciable outlay for additional equipment. A 20-ton refrigeration system will also be installed for the freezing chucks developed by Rohr for use in milling honeycomb. These chucks are used on the two 8 x 20-ft numerically controlled Cincinnati skin mills installed for use on military components.

New 14,000-ton extrusion press, the nation's largest unit of its kind, now is in production at Aluminum Company of America's Lafayette works. Unit is capable of extruding single pieces of aluminum in extreme lengths, with widths up to 39 in., and weighing up to 2500 lb. Designers for civilian industries can now work with aluminum shapes in dimensions formerly available almost exclusively to the military. Previously such extrusions were produced only on a similar 14,000-ton press operated by Alcoa under the Air Force Heavy Press Program

Warner & Swasey Buys Into Wang

Warner & Swasey Co, Cleveland, has acquired a substantial interest in Wang Laboratories Inc, Natick, Mass, developer and manufacturer of a variety of specialized electrical and electronic devices and components, some of which are used on machine tools built by W&S. Wang produces punched tape block readers and encoders and has developed and sold tape-controlled point-to-point positioning systems.

Detroit Gray Iron Sets Up Shaw Process Division

Detroit Gray Iron & Steel Foundries, operating under a license from the Shaw Process Division of British Industries Corp, will manufacture precision iron and steel dies and castings. Initial maximum pouring capacity for the new facilities will be 4000 lb; company expects eventually to be able to handle Shaw Process castings of up to 40,000 lb through its regular facilities.

Lockheed (Ga) Payroll Steadying

Six-month employment tailspin at Lockheed Aircraft's Georgia Division at Marietta is in the leveling-off stage leaving 12,000 workers on

McGIRK'S WORKS by GEO. CRENSHAW

WELCOME TO McGIRK'S WORKS, MR. DRILLER! I'M ALWAYS PROUD TO HIRE INTELLIGENT MEN FULL OF NEW IDEAS!
AT ALL TIMES I WANT YOU TO FEEL PERFECTLY FREE TO OFFER WHATEVER COMMENTS OR SUGGESTIONS YOU MAY HAVE!
SUGGESTION BOX
RRRRARPH!
MOE'S CORNER
We got a suggestion box here in my department too.
SUGGESTIONS

FORMULA FOR TOMORROW

THE MACHINE TOOL EXPOSITION - 1960

INTERNATIONAL AMPHITHEATRE

CHICAGO, ILLINOIS

SEPTEMBER 6-16

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

MMT-PE

Field Report . . .

the job compared with 15,600 at last summer's employment peak. Loss of B-70 subcontract work, added to general reduction stemming from completion of some contracts, accounted for major portion of the layoffs. Lockheed officials, however, are optimistic over the prospects that a bill will be introduced in Congress calling for purchase of two-hundred C-130s for use by AF Reserve as troop-carriers. The C-130 for military use has been in production since December of 1956 and has accounted for the bulk of employment at the Georgia Division.

Tapco Units Relocate

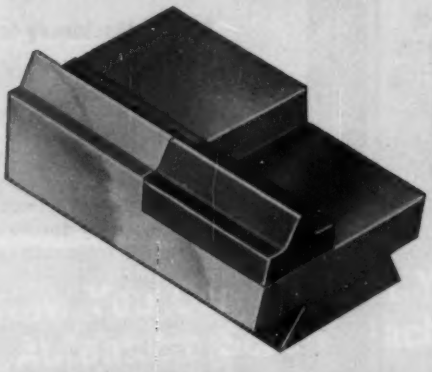
Two production activities of the Tapco Group of Thompson Ramo Wooldridge Inc will be moved from Bell and Long Beach, Calif, to Cleveland during the next couple of months. West Coast production of diesel and aircraft valves will be integrated in the company's valve division operations; hydraulic hardware work will move to the fuel systems works.

Oliver Corp to Distribute British-Made Tractors

The David Brown Corp's Tractor Division at Huddersfield, Yorkshire, and the Oliver Corp of Chicago have signed a purchasing agreement whereby the American company will buy David Brown tractors and market them in the US, Canada, and South America in addition to its own line of tractors. Value of agree-

"I've spent five contented years here—that's not bad out of a total of thirty."

Everybody knows that
National Tool Company
makes all types of
high-speed form tools—



But did you know
we make all types
of carbide-tipped
form tools . . .

and more special cutting tools of all kinds
than any other tool manufacturer?

For more than half a century National Tool Company has supplied high quality precision cutting tools to the metal working industry. When your job requires special cutting tools call your National Tool representative. His assistance is yours for the asking whether you're interested in one *special* tool or a complete tooling program.

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To National Tool Co., 11200 Madison Ave., Cleveland, Ohio

Please send NEW 92 page catalog showing National Tool Company's complete line of special tools for the metal-working industry.

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Examine closely, the holes you drill with an ELDORADO GUN DRILL. See how finely finished, how straight, round and accurate they are. Discover how you can drill a greater variety of holes... all sizes and depths; through solids, blow-holes, hard spots or across holes in confined places... **in one single operation,** to tolerances within tens-of-thousandths. Secondary machining for alignment, enlargement and finish are generally eliminated. Faster penetration, fewer rejects, more holes per grind, lower maintenance and labor costs are positively assured.

Save Now! Include an ELDORADO Gun Drill in your drilling plans. If you need a solution to your 'hole' problem, avail yourself of ELDORADO'S experience and research facilities. Write for full information.

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MADE TO YOUR SPECIFICATIONS:		AVAILABLE FROM STOCK:	
Sizes	.1250" to 2" dia.	⅛" to ½" dia. in 64ths	½" to ¼" dia. in 32nds
OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2¼" long	1" dia. x 2¼" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

Specializing 100% in Gun Drills and Related Tools.

ELDORADO TOOL & mfg. corp.

340 Boston Post Road • Milford, Conn.

* Trade Mark

Field Report . . .

ment and number of vehicles involved has not been disclosed.

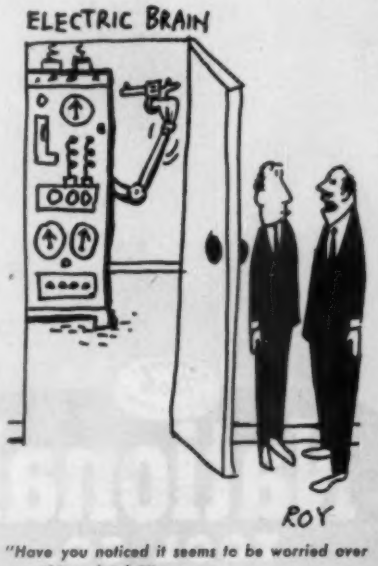
The British-built tractors will start coming to Chicago later this year. They'll incorporate the latest David Brown features including the all-purpose hydraulic system and differential lock introduced in Britain last December.

Flexonics Corp Acquired By Calumet & Hecla

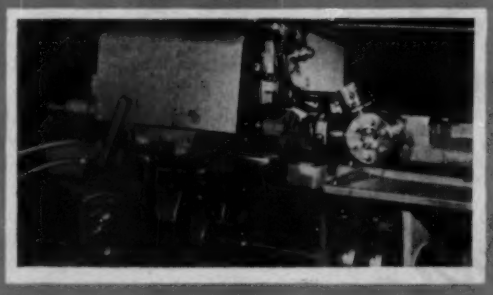
Calumet & Hecla Inc, Chicago, has completed acquisition of substantially all of the preferred and common stock of Flexonics Corp, Maywood, Ill. Company, which will be operated as a subsidiary, manufactures flexible metal and synthetic hose products for industrial, automotive, aircraft, and missile use.

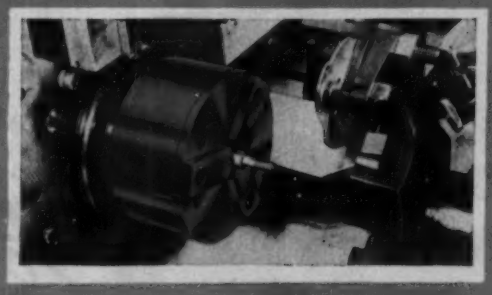
Textile Machinery to Russia

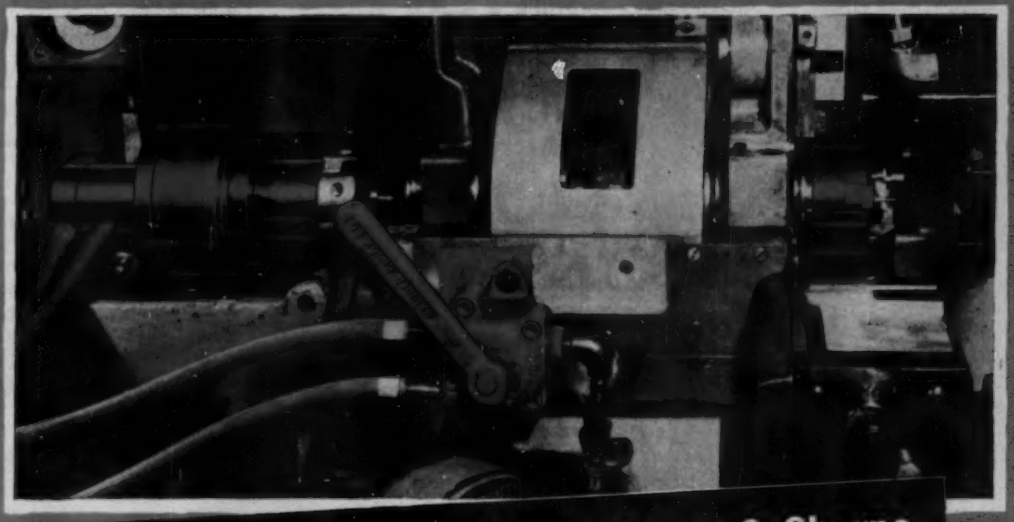
Saco-Lowell Shops, with textile machinery plants in Sanford, NC, and Easley, SC, will be one of the three largest participants ($3 million order) in the $20 million sale of textile machinery by American firms to Russia. Transaction has been negotiated by Intertex Corp of New York, the joint selling agent of some 20 major US textile concerns and about the same number of smaller firms. Another Carolina plant participating is the Cocker Machine & Foundry Co, Ranlo, NC, with a quarter-million-dollar order.



"Have you noticed it seems to be worried over something lately?"







Now You Can Convert Your Brown & Sharpe Automatic Screw Machine to Air Chucking

It is now possible to convert the Brown & Sharpe Automatic Screw Machine to power chucking by means of a Skinner power chucking unit designed for the Models 2 and 2G.

The Skinner power chucking unit consists of a 4-inch air chuck with two or three jaws, soft blank work-holding top jaws, a threaded draw bar, a rotating air cylinder, a cylinder adapter and a control valve. This unit can be installed easily in ninety minutes by any set-up man.

With the addition of this Skinner power chucking unit, your Brown & Sharpe Automatic Screw Machine can chuck cold drawn and odd shaped parts at higher speeds and at less cost.

For greater production, automatic feed hoppers, work ejectors and automatic cam controls can be added to provide automatic chucking that will permit an operator to tend more than one machine.

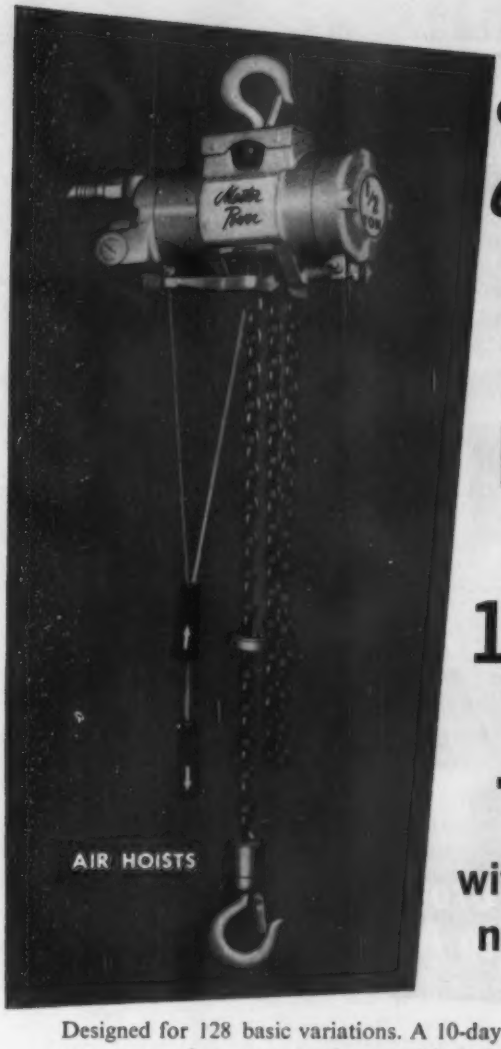
If you plan to purchase a Brown & Sharpe Automatic Screw Machine ask to have the Skinner power chucking unit included. To convert your present Model 2 or 2G, contact a Skinner Representative or write us at Dept. 102.

SKINNER CHUCKS

THE CREST OF QUALITY

SKINNERCHUCKS

THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT



TEST CUSTOMIZED *Master Power* AIR HOIST ON 10-DAY FREE TRIAL

with absolutely no obligation

Designed for 128 basic variations. A 10-day tool test will prove you cannot burn out or damage this hoist with an overload. Positive control from creep to full speed with safe lowering if air or brake fail. Explosion-proof model available. Mail coupon today to arrange a 10-day tool test.

Master Power

Look under TOOLS-PNEUMATIC HOISTS-PNEUMATIC

CORPORATION • Bedford, Ohio

A Black & Decker subsidiary

Master Power Corporation, Dept. 202, Bedford, Ohio

Gentlemen: I want to run a Master Power 10-Day Tool Test. I understand there is no obligation.

☐ I am interested in *Impact Wrenches*
☐ I am interested in *Threaded Fastening Tools*
☐ I am interested in *Percussion Tools*
☐ I am interested in *Abrasive Tools*
☐ I am interested in *Air Hoists*

Company.....

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Street.....City.....Zone.....State.....

In Canada: MASTER PNEUMATIC TOOLS (CANADA) LTD., REXDALE-TORONTO, ONTARIO

Field Report . . .

Ramblers Romping

American Motors turned out 401,446 Ramblers last year and by next fall it'll have a productive capacity of more than 700,000 on an overtime basis, according to President George Romney. Company has purchased land to establish manufacturing facilities for production of more than a million cars a year. Mr Romney predicts that about half of all new cars sold in this country will be compact models by 1963 and, in the event of a recession or bad economic conditions, small car sales could reach the 50% mark before 1963.

Dixon Acquires NC Firm

Dixon Corp, Bristol, RI, designer-manufacturer of drafting change-overs for spinning frames, has purchased the machine shop facilities of Southern Spindle & Flyer Co, Charlotte. Southern will retain its corporate identity and will continue overhauling, moving, and trucking of textile machinery. Acquisition will enable Dixon to market a complete assembly and will place the company closer to its markets.

Rockwell Opens Sales Subsidiary in Switzerland

Rockwell Manufacturing Co, Pittsburgh producer of meters, valves, and other control devices, and industrial tools, has established Rockwell International SA, a wholly

"Can I borrow your lunch for a few minutes?"

NEW GIANT AT WORK on Double Diamond Gears

This huge, continuous, carburizing, hardening and draw furnace now permits even greater instrument control in heat treating DOUBLE DIAMONDS for maximum wear resistance and load-carrying capacity. So far as we can discover no more efficient furnace could be installed to achieve the quality characteristics our gear customers have come to expect.

At your request, our gear engineers would be pleased to describe this process in greater detail and to explain, as well, what our recently expanded facilities can mean in terms of this pledge: "DOUBLE DIAMOND Gears offer the advantages of lower installed cost and economical and dependable service on the job . . . gears that do credit to your product and reputation."

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

CIRCLE 262 READER SERVICE CARD

One of these Wilson "Rockwell" instruments will do your hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

"Rockwell" Hardness Tester—for most hardness testing functions.

"Rockwell" Superficial Tester—for extremely shallow indentations.

TwinTester—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brale" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.

Write for **Bulletin RT-58**

WILSON "ROCKWELL" HARDNESS TESTERS

ACCO

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-B Park Avenue, New York 17, New York

CIRCLE 263 READER SERVICE CARD

4 OUT OF 5 OPERATIONS CAN BE E-L-I-M-I-N-A-T-E-D

A soundly engineered multiple operation tool will bore, ream, face and chamfer at two or three levels with a single plunging cut. Consolidating a series of operations shrinks production costs . . . saves you up to 80 percent in direct labor alone. The benefit of our experience and knowledge of tool geometry is yours for the asking. Ideas, suggestions, drawings submitted without obligation. THE OK TOOL COMPANY, INC., 400 Elm Street, Milford, New Hampshire.

OK modern milling cutters for modern milling machines

Field Report . . .

owned sales subsidiary with offices in Geneva. It'll be responsible for coordinating all of Rockwell's foreign business except in Canada and Mexico. Company now manufactures abroad through a West German subsidiary which it is currently expanding to produce a broader line of the company's products. It obtained the subsidiary in 1957 by purchase of a company manufacturing small diesel and gasoline engines which it continues to make for world markets.

Navy Shipyard Gets $14 Million Job

Two of seven older destroyers will be modernized at the Philadelphia Naval Shipyard at a cost of $7 million each. Work will help to stabilize employment there where 8800 civilians are now on the payroll.

Lee Wilson Forms New Corp

Lee Wilson Engineering Co, Cleveland, and its European licensees have joined to form a new corporation to coordinate sales and manufacturing facilities for the new Open Coil Process of gas alloying and annealing in both the European Common Market and Free Trade Area. To be known as the Lee Wilson Engineering Co, SA, the new

"I'm a slow reader"

Engineered by Tinnerman . . .

SPEED CLIPS® reduce costs, simplify assembly and servicing on Maytag "Halo of Heat" Dryer

Clothes are dried efficiently in the famous Maytag "Halo of Heat" automatic dryer. And now the quality of the "Halo of Heat" dryer is even better than ever because its unique circular heating element is fastened quickly, securely by 22 special Tinnerman SPEED CLIPS developed by joint efforts of Tinnerman and Maytag designers.

Each one-piece SPEED CLIP eliminates a separate welding operation on the "Halo of Heat" assembly. Various screw-driving operations formerly required on Maytag's assembly line to capture the ceramic insulator and secure the mounting clamp were also eliminated, with equally interesting reductions in cost. Now, the stainless steel, vibration-proof fastener is snapped in place with simple "button-hook" action. No special skills or equipment are required. Assembly and parts costs have been reduced . . . *substantially!* Serviceability in the field has been improved.

A free Tinnerman Fastening Analysis of your own product can show you where similar assembly and cost-saving advantages are possible. Call your Tinnerman representative—he's listed in the Yellow Pages under "Fasteners". Or write to:

TINNERMAN PRODUCTS, INC.
Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

TINNERMAN
Speed Nuts®

FASTEST THING IN FASTENINGS®

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S. A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Hecano-Bundy GmbH, Heidelberg.

Pick the one that's right for your job!

It pays to specify

ACE

DRILLS
REAMERS
BLANKS

Carbide Tipped and Solid Carbide
Premium Quality High Speed Steel

BLANK SETS

Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits.

DRILL SETS

Standard stock sets include Fractional, Wire and Letter size drills, packaged in convenient folding index cases.

Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

Field Report . . .

office will be headquartered in Fribourg, Switzerland. It'll function through present licensees in providing sales and engineering information and special mechanical coiling parts of the process. Licensees are Heurtey in Belgium, France, and Italy; Incandescent Heat Co Ltd in England; and Ofag in Germany.

Mount Hope Machinery Co . . .

. . . Taunton, Mass, producer of tools used in textile, paper, and plastics processing, is building a new plant in Charlotte, NC, to house manufacturing and southern sales operations.

Portland Cement Expands in South

Company is launching a $4 million expansion of its giant plant at Harleyville, SC. Construction will begin immediately on the project with the addition of a fourth kiln of 1.1 million barrels. Additional cement storage and shipping facilities will also be included. The Harleyville plant has been enlarged twice since it began operations in 1948.

Republic-Odin Appliance Corp . . .

. . . Los Angeles manufacturer of electric and gas heaters, will build a million-dollar assembly plant at Charleston, SC, within the next two years. Firm now has plants under construction at Dallas, Tex, and Portland, Ore. Other facilities are located in Chicago and Erie, Penna. Company sales this year are expected to pass the $18-million mark.

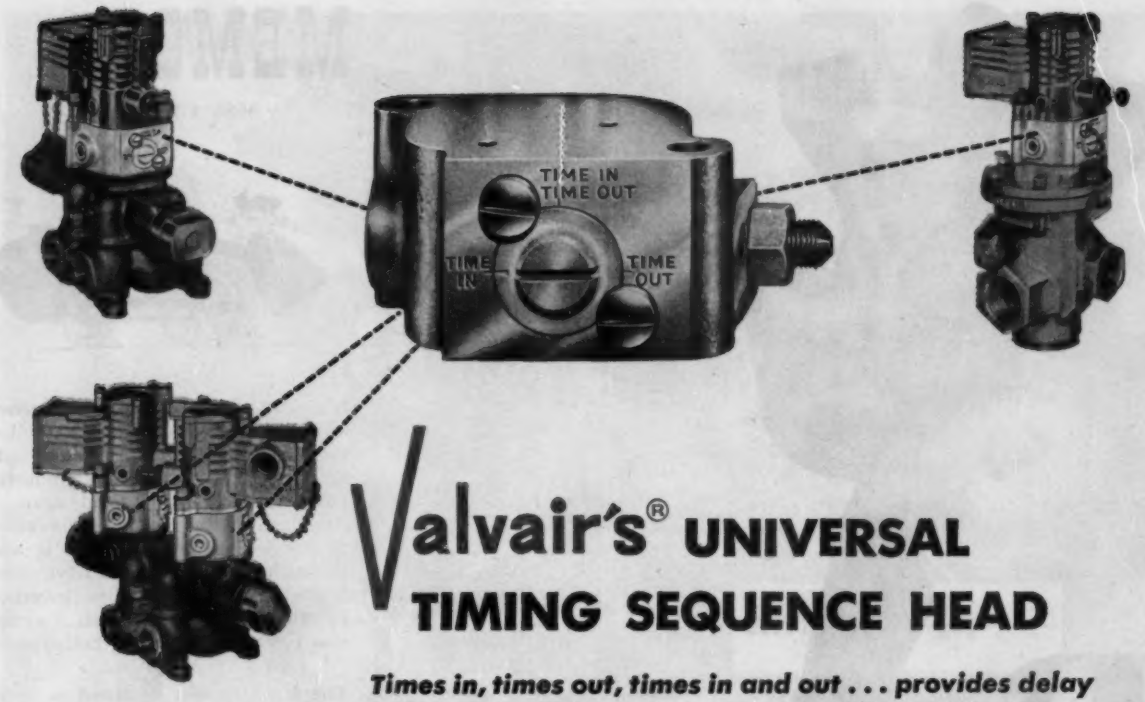
"You sure you're back there, Mart?"

Spray lubrication cuts metal-forming costs

Another benefit of DeVilbiss total service

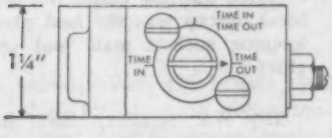
DeVilbiss WDB automatic spray guns are specially designed for cycled or continuous application of lubricants and coolants during metal-forming and machining operations. Durable WDB guns are adjustable for spray-pattern size, shape, and fluid volume. Fully automatic or manually operated control valves provide up to 60 spray cycles per minute. Contact your nearest DeVilbiss representative or write: The DeVilbiss Company, Toledo 1, Ohio.

FOR TOTAL SERVICE, CALL
DEVILBISS



Valvair's® UNIVERSAL TIMING SEQUENCE HEAD

Times in, times out, times in and out . . . provides delay from 0 up to 30 seconds . . . repeatability within 2% . . . changes function without disassembly . . . for use with any Valvair Speed King or Inline Valve



For accurate control, to simplify circuits, to eliminate timers and relays, to lower control component installation and maintenance costs, use Valvair's universal timing sequence head. This unit is supplied in two types; one for direct mounting between the pilot and valve body; one for direct mounting on the valve body, with remote pilot control.

Function can be changed in seconds, *without disassembly* and with line pressure on the valve. Just loosen the lock screws slightly, turn the indicating barrel to the desired function mark, then tighten the lock screws.

A port is provided for installation of accessory reservoir capacity . . . delay can be extended up to several minutes. And, the Valvair name on this unit is your assurance of sound design, quality construction, micro-accurate performance and multi-million cycle dependability!

Find out how Valvair's sequence head can provide the results you want, at a cost saving you'll like, on the new equipment you're designing or on existing machines you're up-grading. Yes, this sequence head can be used on your present SPEED KING and INLINE valves, too. Ask your Valvair or Bellows Field Engineer for recommendations . . . they're located in over 125 major industrial cities.

For more information, write for Bulletin E-1A. Address Dept. AM-260 Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio.

Valvair

AKRON 11, OHIO

Other INDUSTRIAL DIVISIONS of IBEC: The Sinclair-Collins Valve Co. The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio.

8079

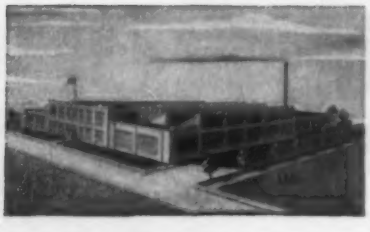
Relax!

It's easy to do when you let Columbus Die-Tool handle your special tooling problems.

Many leading companies all over the United States are now availing themselves of our creative engineering staff, modern plant and equipment, to design and build their special tools, jigs, fixtures and machines. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to your exacting requirements. Increase the efficiency of your operation with special tools that do the job better—faster—more economically . . . designed and made by Columbus Die-Tool.

FREE: *New brochure listing complete facilities and equipment. Write today.*

Columbus Die-Tool



AND MACHINE COMPANY

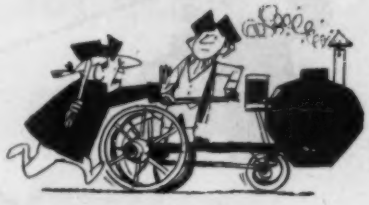
P.O. BOX 750 • COLUMBUS, OHIO

SERVING INDUSTRY SINCE 1906

Designers and manufacturers of Jigs • Fixtures • Special Tools • Units for Machine Tools • Builders of Machine Tools Complete

MEMOS

by BESS RITTER

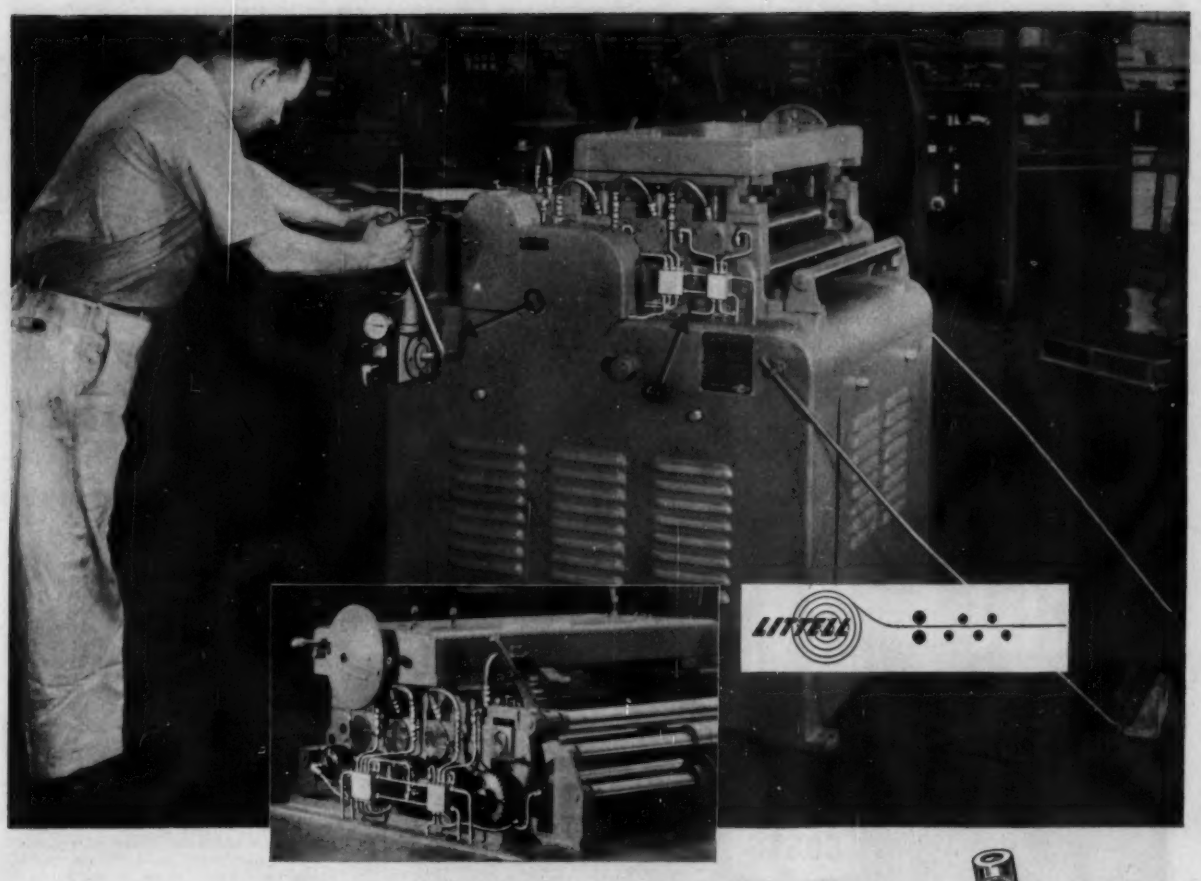


If a machine that is still in existence today had been properly exploited by King Louis XVI of France it is probable that the man might never have been beheaded. And again if Napoleon had permitted its inventor to improve this machine it is also probable that he would have done better. Yet this machine, invented by Capt Nicholas Joseph Cugnot, was easily accessible to both rulers.

The machine was designed to serve as a carriage for guns and a tractor for artillery, and was motivated by steam. Its first version carried four people at 2¾ mph, and was built during the reign of Louis XV. Its second version was built in 1770, and could travel at 3 mph. Its third and fourth versions would have exhibited still greater improvements but they were never built because the inventor, by this time, was languishing in jail. His crime was making too sharp a turn when he tested Vehicle No. 2 on a Paris street. It capsized and the police felt that the local lockup was the best place for keeping such a man "out of mischief."

The War Ministry itself had financed Captain Cugnot's work, and the sum involved by this time was considerable. Yet instead of immediately demanding his release, it did nothing to prevent the man's sentence from being converted into exile from France altogether. Napoleon recalled the inventor, pensioned him, and actually encouraged him to continue his experiments—but only as long as none of his work had anything to do with military vehicles.

Cugnot's machine is the prototype of today's power-driven army vehicles. The first version was driven by a two-cylinder engine. The second version—the one which caused Cugnot's complete demise—utilized the rack-and-pinion steering principle.



Farval Centralized Lubrication on Littell Straightening Machine Eliminates Down-time, Saves Bearings

This versatile No. 424 Littell Machine straightens coiled steel stock .050" thick by 24" wide, and automatically supplies a free loop of pre-straightened stock at proper speeds required for smooth, efficient punch-press operation—even through the most complicated progressive dies.

Keeping press output at top level allows no down-time for the Littell No. 424 straightener. Its built-in Farval Manual Dualine System protects the machine's 24 most important bearings—keeps them adequately lubricated while the machine remains continuously on the job.

On industrial equipment all over the world, Farval delivers measured amounts of clean lubricant at regular intervals to all vital bearings. From a central station, lubricant is pumped under pressure to a measuring valve at each bearing, providing the exact amount of lubricant desired.

If you want your production equipment to stay in top-operating condition—to reduce costs, boost profits—then write for free Bulletin 26-S. It tells the complete "Farval Story".

Farval Division · Eaton Manufacturing Company
3254 East 80th Street · Cleveland 4, Ohio

FARVAL
—Studies in Centralized Lubrication No. 249

KEYS TO ADEQUATE LUBRICATION

—wherever you see the sign of Farval —the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.

ELGIN
SOLID CARBIDE END MILLS

CUT PIECE PART COSTS 88%

Recently a manufacturer experienced increasing costs due to short tool life in milling magnesium sand castings to house a radar antenna. The milled part was roughly circular, approximately 3 feet long and the cut ranged from a few thousandths to as much as ½-inch. Its irregular shape made it impossible to eliminate vibration during milling.

The manufacturer had been using a ½-inch high speed steel end mill that cost $3.75 and averaged 15 pieces. Our distributor was sure an Elgin ½-inch Series 255 carbide end mill would more than pay its $19.20 cost. After the first Elgin solid carbide end mill produced 650 pieces, the manufacturer stopped counting! The tool cost per piece dropped from 25 cents to 3 cents. Elgin saved 88% of the piece part cost and consistently delivered a more accurate cut and a better finish . . . proof that you don't always need new machines to set new performance and economy records.

To learn how Elgin Solid Carbide rotary cutting tools can save you money on the production line call your Elgin distributor or write directly to:

SEND FOR THIS FREE, VALUABLE BOOKLET . . . describing and illustrating Elgin's complete line of solid carbide rotary cutting tools.

Abrasives Division
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 PRESS BRAKES—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY.* 28-page bulletin 89E illustrates and describes enlarged, redesigned line of Series N press brakes, 90 through 1500 tons. Covers design features, special work area provisions, typical forming and bending dies, tables for computing bending, punching, and blanking tonnages, die space and filler block dimensions, detailed specifications.

2 GEAR-DRIVE DRILLPRESSES — *Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio.* Illustrated brochure on 18 and 24-in. constant power units contains specifications and detailed description of features on seven models including positive drive at all loads and speeds, instant speed selection, and triple-action depth stop.

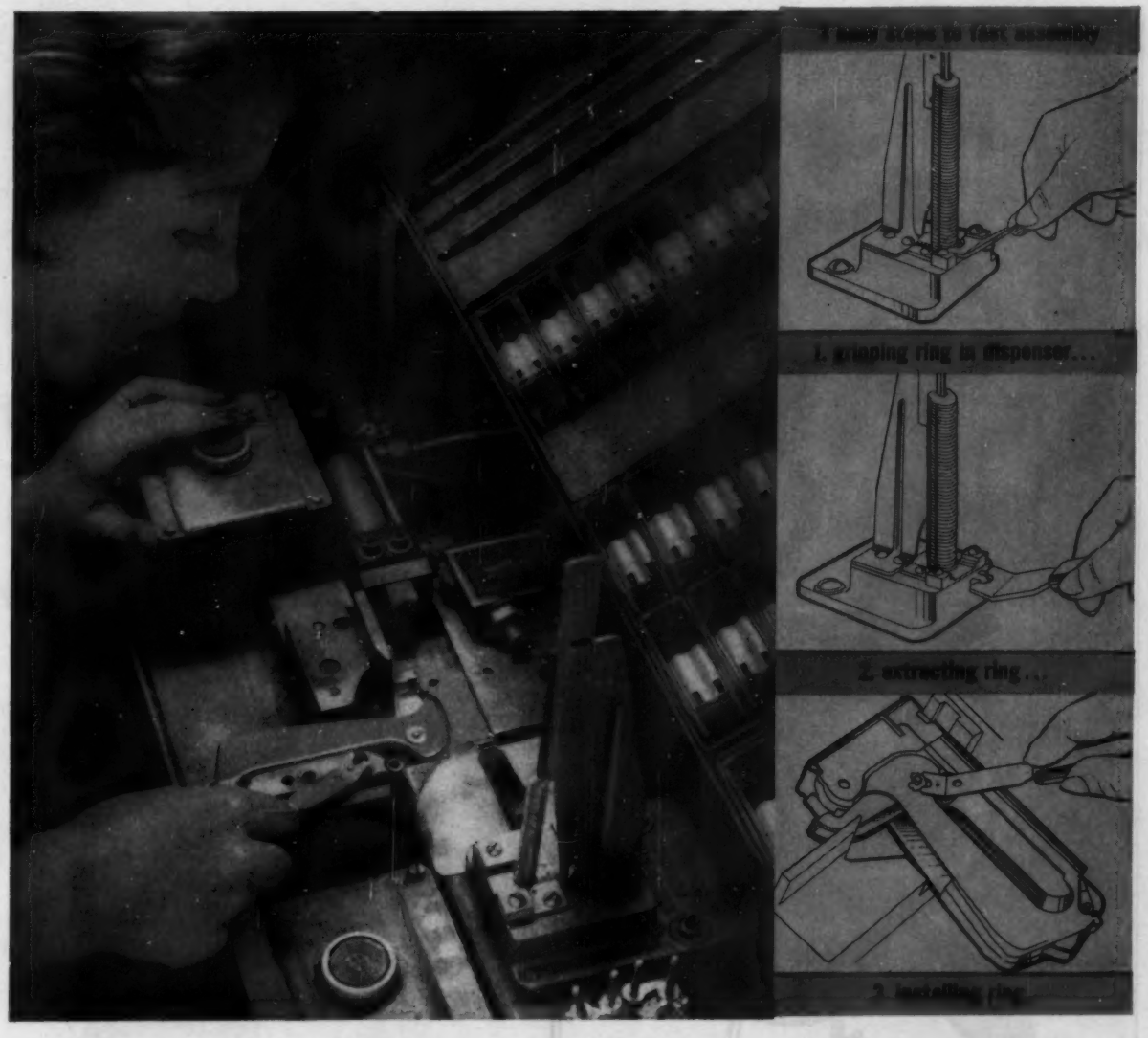
3 BAND MACHINES—*DoAll Co, Des Plaines, Ill.* 8-page brochure pictures and describes the Zephyr line of high tool velocity units available in four models with capacity 15 x 36 in. Features include 36-in. throats; 20-in. work height; 36-in.-dia wheels; drive motors up to 10 hp; speeds up to 15,000 fpm; cuts ferrous materials including stainless up to 1 in. thick; nonferrous metals and non-metallic materials can be cut as rapidly as they can be fed through the machine.

4 ELECTROLYTIC CAVITY SINKER —*Anocut Engineering Co, 631 W Washington Blvd, Chicago 6, Ill.* 6-page bulletin 200 gives details on Model HCS-59 in which the driving motion of the electrode is in a horizontal direction. Penetration rates are 0.001 to 0.005 ips; metal removal rates are 18-60 cu in. per hr; surface finish at max removal rate, 10-100 mu in. Principle, applications, features, specifications covered.

5 MULTIPLE DRILLING AND TAPPING HEADS—*Jarvis Corp, Middletown, Conn.* Brochure illustrates and points out advantages of a new type of universal joint multiple head designed to convert easily to a fixed head with the addition of a Jarvis spindle cluster plate.

6 TABLETING EQUIPMENT—*Arthur Colton Co, 3400 E Lafayette, Detroit 7, Mich.* 8-page general catalog AC-61 illustrates and describes line of machines for tableting electronic disks, ferrite cores,

"You do nice work!"



Truarc rings and dispenser speed staple gun assembly 60%

This big production increase was made by Swingline, Inc., Long Island City, N. Y. in assembling the handle lock of their high-compression staple gun.

To speed production, the Truarc Prong-Lock® Series 5139 retaining rings come *pre-stacked* for use on the Truarc *dispenser* (shown in foreground of photo above). Application is simple, fast and requires no skill. The operator, using the Truarc *applicator*, grasps the bottom ring, removes it from the stack, and installs it, quickly and easily, in the staple gun assembly.

The Truarc ring replaced an ordinary flat "C" washer, previously used in this application. *While the unit cost of the washer was lower than that of the Truarc retaining ring, the use of the rings resulted in assembled cost savings of $25.00 per thousand staple guns.* The reasons: a 60% increase in production due to faster, easier assembly with Truarc tools, and the elimination of time-consuming, costly adjustments made possible by Truarc rings. What's more, the bowed Prong-Lock ring improved product design by providing resilient end-play take-up... eliminating looseness or binding in the parts.

Truarc retaining rings come in 50 functionally different types... as many as 97 different sizes within a type... 6 metal specifications and 13 finishes. Truarc assembly tools, pliers, applicators, dispensers and grooving tools are available to speed production of virtually every kind of product. Make sure you have on file the new 16-page Waldes Truarc Assembly Tool Catalog No. AT 10-58. Write for your copy today. And remember Waldes engineers are always ready to help you solve your special application problems. Waldes Kohinoor Inc., 47-16 Austel Place, Long Island City 1, N. Y.

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WALDES TRUARC® RETAINING RINGS

Waldes Kohinoor Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS...THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS

Take me to your buyer ...I'm the leader!
• Want to bring your brush costs down to Earth? Pittsburgh's complete line of power-driven and hand brushes... for any job, in any industry... can lead the way.
• For the address of your Pittsburgh brush supplier, write or CALL COLLECT, Pittsburgh Plate Glass Co., Brush Div., 3221 Frederick Ave., Baltimore 29, Md.
PITTSBURGH PLATE GLASS COMPANY

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

powder metal parts and plastics, as well as chemical catalysts, and paints. Other equipment covered includes drying ovens, coating stands, mixers, granulators, tablet press punches and dies.

7 CELL AND WEDGE INSERTING MACHINES—*Possis Machine Corp. 1645 Hennepin Ave, Minneapolis 3, Minn.* 4-page illustrated bulletin 598CW gives details on new automatic machines used in the manufacture of armatures. Describes simplified operation, gives capacities and dimensions. Units insert slots up to 5 in. in length; insert up to 2 slots per second; handle a wide variety of armatures. Tooling changeover can be accomplished in 7 to 12 minutes.

TOOLS AND ACCESSORIES

8 MOUNTED WHEELS — *Cincinnati Milling Machine Co, Milling Products Division, Cincinnati 9, Ohio.* 6-page booklet PG-358 describes features and contains complete chart showing all standard shapes and sizes. Includes a table showing recommended starting grades for various jobs and lists several rules of thumb to follow in selecting mounted point wheel grades.

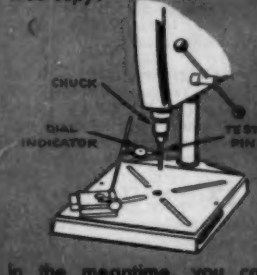
9 ACCESSORY EQUIPMENT FOR SURFACE PLATES—*Herman Stone Co, 1580 N Gettysburg Ave, Dayton 27, Ohio.* 4-page bulletin B is combination catalog and price list that describes and pictures a complete line of precision measuring products including Air Lift angle blocks and riser blocks, straight edges, parallels, toolmakers' flats, and many others. Also describes special field inspection service for checking surface plate accuracy, and a relapping service for restoring accuracy of worn plates.

10 BORING BARS—*Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich.* 8-page illustrated bulletin B-1259 covers all available standard boring bars including micro-adjustable interchangeable head, micro-adjustable and non-adjustable types. All bars use square or triangular throw-away carbide inserts. Engineering and specification data included on the five different styles.

11 AIR GAGING INSTRUMENTS — *Dearborn Gage Co, Air Gage Division, 22330 Ford Rd, Garden City, Mich.* 16-page catalog contains complete specification and price information on expanded line of Dearbornaire precision instruments, elements, and related accessory equipment. Describes single and multiple column units equipped with new Multi-Amp tube which permits

"I really haven't time to read them, but thanks anyway. I like to be kept up to date on stuff."

Supreme publishes an Engineering Catalog that gives exact information on testing a chuck for accuracy. This catalog defines and guarantees each Supreme Chuck's runout limits. *Write for your free copy.*



In the meantime, you can make an accuracy test by this method: Fit a hardened test pin into the chuck. Clamp a dial indicator to the machine so that its point touches the test pin an inch or more below the chuck. If runout is indicated, remove the chuck and repeat test on the arbor or spindle to determine the offending part.

Dirt or chips in the chuck arbor hole can cause runout; so can bent spindles or loose bearings. Look for the real cause.

Tool room accuracy for production line use

Supreme BRAND Chucks

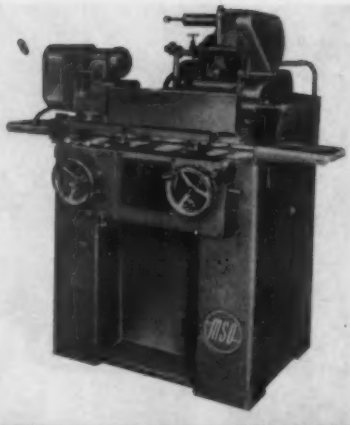
SUPREME PRODUCTS CORPORATION
2222 SOUTH CALUMET AVENUE · CHICAGO 16, ILLINOIS
DIV. OF A·S·R PRODUCTS CORP.

MSO GRINDERS - PACEMAKERS for better grinding methods—

The ultimate in precision grinding to close tolerances with micro inch finish — for Toolroom — for Production

MSO builds
- Universal Grinders
- Production Grinders with automatic plunge or traverse grinding cycles
- Thread Grinders

When only the best will do — check MSO first



Model FMES Universal Grinder with compound swivel wheelhead capacity 7" x 12"

austin industrial corporation

76-F Mamaroneck Avenue White Plains, New York

MSO JIG BORING MACHINE

WITH LEITZ OPTICS

Table size — 33½" x 18½"
Spindle speeds — 63 — 2000 RPM
Boring depth — 12"
Net Weight — 7500 lbs.

MSO The ULTIMATE in

precision *speed* *ease*

Setting accuracy .00002", Positioning accuracy .00012"

Select any point as starting point. "Zero-in" scales by push button. Read scales to millionths without leaving operator's position.

Direct reading on magnified screens in any quadrant from zero point. Table moves on double roller guides.

When only the best will do — check MSO first.

austin industrial corporation

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Free Literature

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conversion from one amplification to another by changing calibrated scales.

12 DRILLS AND REAMERS—*Special Drill & Reamer Corp, 428 E 11 Mile Rd, Madison Heights, Mich.* 4-page illustrated brochure gives data on drills, reamers, and cutters made of HSS, HSS with carbide tip, or solid carbide.

13 SURFACE MEASUREMENT REFERENCE MANUAL—*Brush Instruments, Division of Clevite Corp, 37th and Perkins, Cleveland 14, Ohio.* Pocket size 12-page illustrated publication contains excerpts from ASA B46.1-1955 for surface roughness, waviness, and lay. Covers classification of surface characteristics, status measuring instruments, precision reference specimens, roughness width cutoff, and notes on control of surface roughness. Includes chart for converting arithmetical average to root mean square averages in microinches. Also illustrates and describes the Surfindicator, a production gage for finish control.

14 DIE PROTECTION—*Micro Switch, Freeport, Ill.* Series of five sheets offer lowcost ways to prevent damage to tools and dies with precision switches. Each sheet pictures and describes how a precision switch can be incorporated into the design of a die to insure correct, safe operation. Cross-sectional diagrams and construction details included.

15 AIR TOOLS — *Newage Industries Inc, 222 York Rd, Jenkintown, Penna.* Catalog describing Desoutter (English) air tools contains specifications and features of new silent, compact Power Atom screwdrivers, corner screwdrivers, nut runners, miniature screwdrivers, wrenches, tappers, grinders, and accessories. Includes prices, technical data, dimensions, photos.

16 BINOCULAR MAGNIFIER—*Edroy Products Co, 480 Lexington Ave, New York 17, NY.* 6-page folder contains information on the 3-D Magni-Focuser that can be worn with or without glasses. Twenty applications illustrated.

17 MAINTENANCE OF UNITIZED TOOLING—*Punch Products Corp, 3800 Highland Ave, Niagara Falls, NY.* 19-page illustrated manual covers such sub-

"I like the way you work . . . when are ya gonna start?"

Your DoALL sawing specialist can help you get all the benefits of band machining

Laneko Engineering Company of Philadelphia has had wide experience in the contour cutting of metals with DoALL Band Saws. They used a DoALL Model V-36 and were well satisfied with the results. Then they added a new DoALL 26-3 and overnight graduated from band sawing to band machining.

In a typical test Bill Cole, sawing specialist of the DoALL Philadelphia Company, demonstrated that band machining could deliver tremendous savings in cutting time. The job, shown in the photo, consisted of contour cutting a block of AISI#4140 steel, 6½" x 6½" x 17". Formerly this took 10½ hours. With a power table replacing the old hand feed and following Bill Cole's recommendation of using a Demon* HSS Blade, the job was completed in just three hours—a 72% saving in time alone.

There are more than 200 DoALL Sawing Specialists from coast to coast experienced in cutting production costs with band machining. Call your DoALL Specialist today. His expert help—plus the help of the DoALL Research Laboratory—is free.

*Reg. T.M.—The DoALL Company

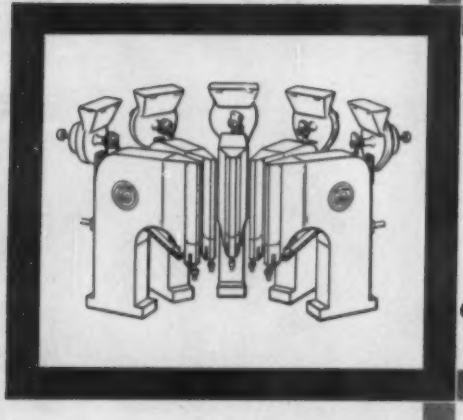
Large photo: Bill Cole of DoALL Philadelphia Company discussing proper feed, speed and blade with Mr. William Neff, Jr. (left) of Laneko Engineering Company. Small photo: both V-36 and new 26-3 DoALL Band Saws working side by side at Laneko.

THIS IS A TYPICAL DoALL STORE

SB-81 **The DoALL Company, Des Plaines, Illinois**

NEW "BUILDING BLOCKS"

. . . for automatic riveting

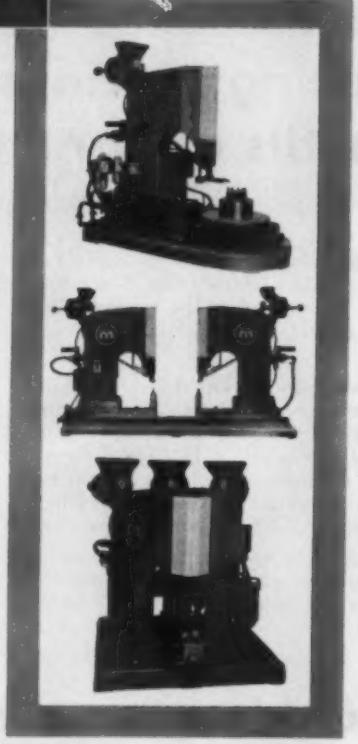


Milford's Models 56 and 57 offer unlimited flexibility in automatic assembly

The narrow wedge shape of Milford's new air-actuated riveters permits unusually close riveting. Both models can be combined with sliding-fixtures, indexing tables or similar attachments to give greatest flexibility of assembly. Air-operated toggle action assures fast and safe action. Model 56 handles tubular rivets from ⅛" diameter x ⅝" length; Model 57 from 3/16" diameter x 3/4" length.

Group these new "Building Blocks" to suit your own production needs. Use them singly, in pairs, in threes, fours or even fives. Multiple riveting is the newest answer to reducing production costs.

For more new ideas, tips and technical data on tubular rivets and rivet-setting machines, ask your Milford Representative for a look at Milford's new MANUAL OF MODERN RIVETING PRACTICE.



THE MILFORD RIVET

MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

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jects as greater punch and die life; proper punch length and die button height; punch and die clearance; stripping essentials; standardisation of punching shoes; tonnage formula; die setting procedures; inventory control of units and parts.

18 OPTIC AND MATH AIDS—*Edmund Scientific Co, Barrington, NJ.* 128-page catalog covers items related to production, laboratory, and quality control equipment; engineering and technical instruments; optical apparatus and parts.

19 ELECTRONIC COMPUTING SYSTEM—*Royal McBee Corp, Data Processing Division, Port Chester, NY.* Catalog sheet S-482 gives complete specifications on new RPC-4000, a fully transistorized, stored program, general purpose computing system for both engineering and business data processing. Basic system consists of the computer and a punched paper tape typewriter input-output unit. Optional high-speed input-output equipment is available.

20 ELECTRON MICROSCOPE PROBLEMS—*Philips Electronic Instruments, 750 S Fulton Ave, Mount Vernon, NY.* 6-page folder describing scientific investigations at Franklin Institute covers: study of mechanisms of plastic deformation in metals and alloys using dislocation patterns; radiation damage in metals from neutron bombardment; strength of thin foils; perfection of evaporated films. Technical equipment procedures and results obtained illustrated.

HEAT TREATING AND WELDING

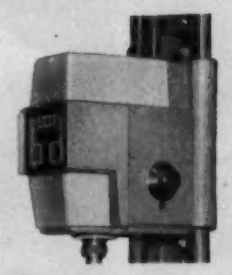
21 GAS WELDING AND CUTTING HAND TORCHES—*Air Reduction Sales Co, 150 E 42nd St, New York 17, NY.* 36-page catalog (Form ADC 702E) covers complete line of equipment; also contains information on many new products and improvements including the general purpose welding torch with stainless steel head and fixed flow valves; two series of hand cutting torches; four cutting attachments; Berns-O-Matic Kits for utility flame heating applications; natural gas heating and brazing tips; and a wide variety of cutting and washing tips.

(Continued on p 190)

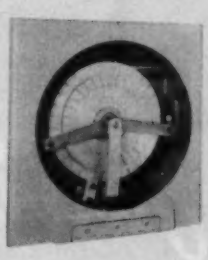
"What's this I hear about you getting a new automobile as a Christmas present from our scrap buyer, Fenwick?"

Here's Why Accurate Honing Is Easier On The New BarnesdriL Model 244...

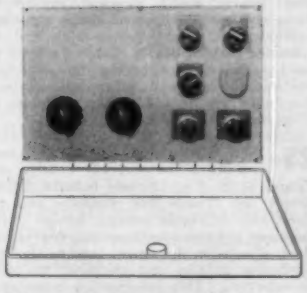
Hone Feed — simple dial gives infinite adjustment.



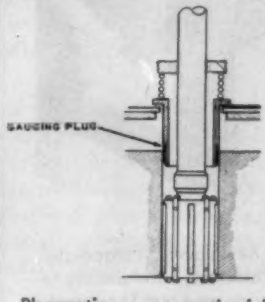
4-Speeds — turn of knob selects desired speed rate.



Reciprocation — length of stroke selected by convenient dial.

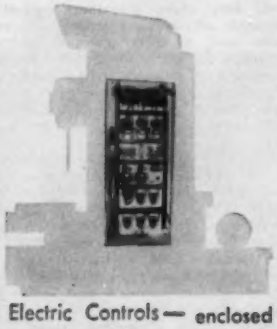


Set-Up — controls under lock and key.

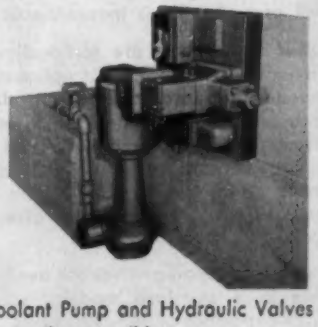


Plugmatic — automatic sizing assures accuracy within .0002".

Operating Controls — mounted at shoulder height.



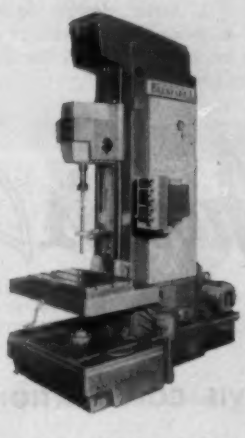
All Electric Controls — enclosed inside machine column.



Coolant Pump and Hydraulic Valves — easily accessible.

Hydraulic Pump — in open, for easy maintenance.

BarnesdriL offers a completely new honing machine for high production honing of bores ½" to 6" in diameter. Large diameter applications depend upon amount of stock removal, bore length, and material. Machine is available with one or two spindles and a choice of three stroke lengths: 15", 25", or 40". For complete details see your BarnesdriL representative or write for new bulletin H-112 today!



BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 13121 Puritan Avenue

Twice the Power!
Twice the Life!

NEW
Jarvis

"TORQOMATIC" TAPPING HEADS

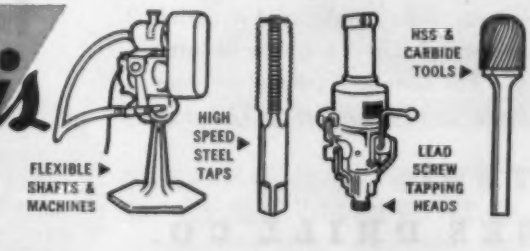
Here is the new Jarvis "Torqomatic" tapping attachment—completely redesigned inside and out! The rugged magnesium body now houses a unique clutch with "straight-line" action . . . response to fingertip pressure on the drill press handle is instantaneous.

Jarvis Torqomatics are tortionally-driven and may be run at optimum speed for the material being tapped. Because it operates with the least amount of pressure on the tap itself, a Torqomatic keeps tap wear and breakage at a minimum . . . produces accurate threads hour after hour.

Slightest pressure of the tap against the work causes the clutch to be fully engaged. Straight-line action of this new clutch provides a 100% driving surface, eliminates any slippage. This basic design feature results in twice the power of the former model, with clutch life more than doubled.

Torqomatic tapping heads are available in 9 standard models, with chuck capacities of 3/16", 1/4", or 5/16". They can be furnished to fit any drill press or tapping machine. For a real demonstration of tapping speed, accuracy and trouble-free performance, get in touch with your Jarvis representative!

Jarvis



JARVIS CORPORATION • MIDDLETOWN, CONNECTICUT

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22 ARCAIR TORCHES—*Arcair Co, PO Box 451, Lancaster, Ohio.* Quarterly publication, Arcair News, covers applications, developments, new product news, case studies of wide range of applications that can be performed with these torches. Copies may be obtained by sending name, title, company name and address.

23 LOW-TEMP BRAZING ALLOYS—*American Brazing Alloys Co, PO Box 11, Pelham NY.* 4-page brochure lists compositions, melting points and other data on line of silver solder and other brazing alloys available. Contains comparison chart with other leading brands.

PLANT SERVICE EQUIPMENT

24 INTERIOR FIRE FIGHTING EQUIPMENT — *Fyr-Fyter Co 221 Crane St Dayton 1 Ohio.* 28-page 1960 catalog (Form S-62) presents engineering facts and specifications on Globe automatic sprinkler systems; C-O-Two high and low pressure carbon dioxide systems; smoke detection systems; dry chemical systems; foam systems; fire hose and extinguisher cabinets; fire hose racks and reels; portable extinguishers; and accessory products.

25 CONDENSATION PUMPS—*American Air Filter Co, 215 Central Ave, Louisville 8, Ky.* 12-page bulletin CP-600 covers the Illinois line; explains and pictures the six basic pumps; covers design features, general specifications, engineering data, dimension drawings, construction and operation details, and checklist to follow in selection. This information pertains to both single and duplex units.

26 AUTOMATIC COATING MACHINE —*Conforming Matrix Corp, 221 Toledo Factories Bldg, Toledo 2, Ohio.* Illustrated data sheet describes method of application of coating compounds to small articles such as electrical and electronic components at rate of 4000 per hr. Explains how sprayable resinous compositions, such as epoxy compounds, can be used to completely form a light tight seal for selenium diodes.

27 AIR SUPPLY FOR BLOW-OFF SYSTEMS—*US Hoffman Machinery Corp, Dept EJM, 103 Fourth Ave, New York 3, NY.* 4-page illustrated literature is a guide to designing lowcost air supply systems for blowing off chips, dust, and other particles from machine surfaces. Includes information on the relative performance of pressure systems and shows how a more effective blowing job can be accomplished with much less power input. Through the use of low pressure air in the 1.5 psig range, and a separate centrifugal blower, power is saved and the main air

"And when an executive retires, does everybody move up a notch?"

We "lower the line" for others...

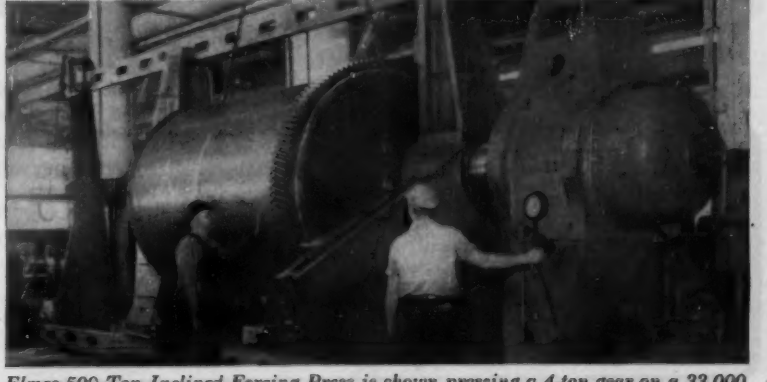
We can lower it for You!

Time after time, production men come to Elmes for help in combating rising costs on jobs involving presswork. And time after time, Elmes engineers provide *job-fitted* installations that result in cost-lowering, profit-making performance.

Solving "pressing problems" is not new for Elmes, where an outstanding leadership in engineering service has been maintained for over a century. Sometimes the answer is found in a standard design Elmes® Press, or a standard design with modifications. Or, in unusual situations, special custom-built units may be needed. In any case, an Elmes recommendation will meet requirements *exactly*—an Elmes installation will provide *high productivity, trouble-free operation, minimum maintenance.*

Get a new "line" on *your* production costs. Talk it over with your nearby Elmes Distributor, or write to us direct.

(Right) Elmes 250-Ton Open-Side Press straightening steel castings on a high production schedule. Proved 40% faster than presses previously used, it is also more accessible, more economical to operate.



Elmes 500-Ton Inclined Forcing Press is shown pressing a 4-ton gear on a 33,000 lb. hoisting drum for a huge ladle crane. Pressure of 120 tons was required to force the gear into place. User reports 50% savings in costs of these large gear installations with the Elmes equipment—"job-fitted" for maximum productivity with low costs.

American Steel Foundries

Elmes ENGINEERING DIVISION

FORMULA FOR MMT=PE TOMORROW

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METAL-WORKING PRESSES • PLASTIC MOLDING PRESSES • PUMPS • ACCUMULATORS

Speed your forming and fabricating

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QUICK FACTS FOLDER describes all Di-Acro machines and tells how they speed your metalworking. For your free copy consult the yellow pages under Machinery-Machine Tools for your distributor or write us.

O'NEIL-IRWIN MFG. CO.
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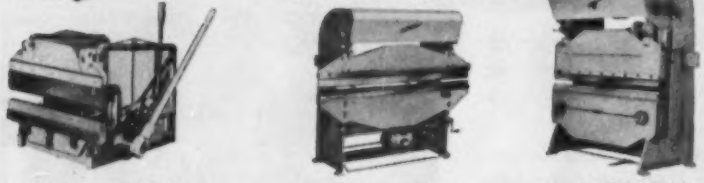
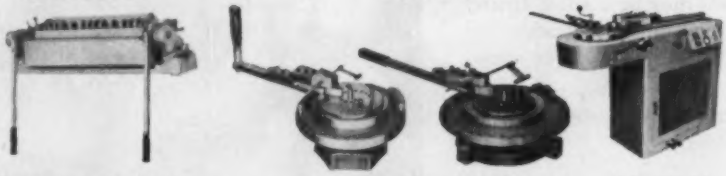
PRESS BRAKES



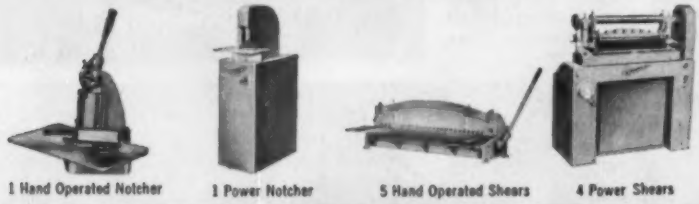
1 Hand Operated Model | 3—12 Ton Models | 2—25 Ton Models

BRAKES **BENDERS**



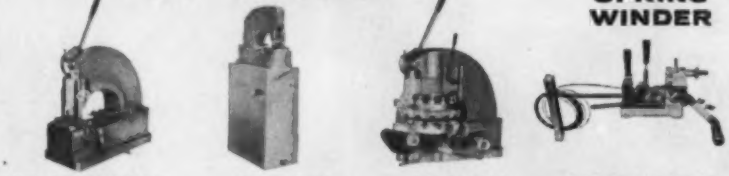
11 Hand Operated Models | 5 Hand Operated Models | 2 Power Models

SHEARS and NOTCHERS



1 Hand Operated Notcher | 1 Power Notcher | 5 Hand Operated Shears | 4 Power Shears

PUNCH PRESSES **SPRING WINDER**



2 Hand Operated Models | 2 Power Models | 1 Turret Model | 1 Hand Operated Model

ROLLERS **ROD PARTERS**

8 Hand Operated Models | 6 Power Models | 2 Hand Operated Models | 6 Power Models

Free Literature

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system relieved of the blowing load making air available for tools and other devices.

28 UNIT AIR FILTERS — *American Air Filter Co, Dept PD, 215 Central Ave, Louisville, 8, Ky.* 12-page bulletin 207 pictures and describes construction and application of permanent washable unit air filters. Covers Type HV-2, high capacity, low resistance unit; Type M/W heavy-duty metal filter; Type AL-2 aluminum filter; Type S spray booth filter; and special units such as used with radar, electronic cabinet ventilation, airplane engine intake.

29 STEEL EQUIPMENT—*Lyon Metal Products Inc, 1 Plant Ave, Aurora, Ill.* 92-page general catalog 100-H illustrates complete line of products for business and industry. New items include drawer tool stand, drawing table, benches. Gives specifications and installation views.

30 PRESSURIZED METAL SPRAY GUNS—*Metallizing Co of America Inc, 3520 W Carroll Ave, Chicago 24, Ill.* Illustrated brochure contains information on new Powder Jet guns and their applications which include metal build-up, repair, and salvage of parts and equipment, plus ceramic coating. Unit uses atomized metal, propelled at high speeds by air pressure. Spray penetrates, fills, and repairs cracks and porous parts.

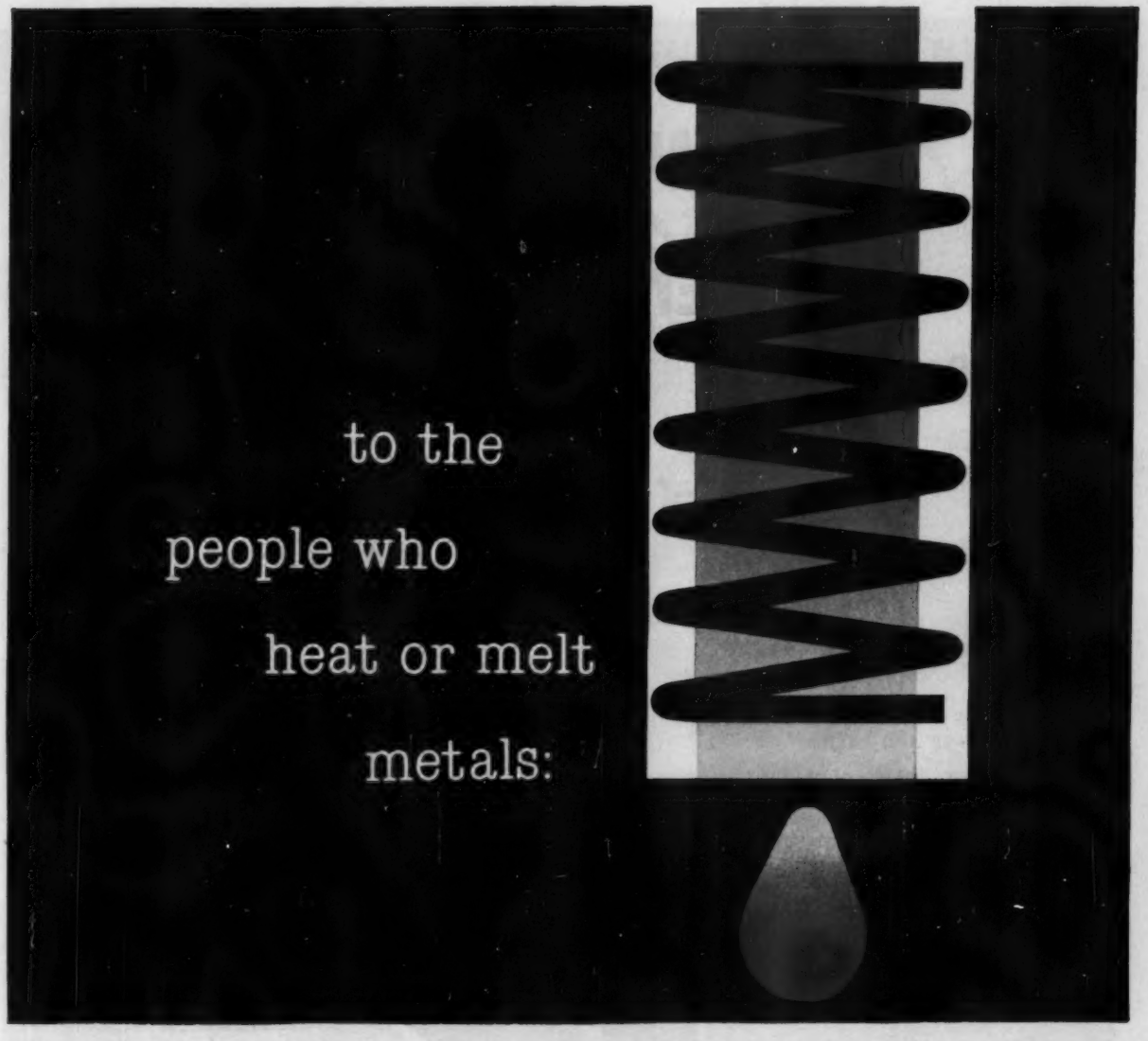
31 ROTOBLAST TABLE-ROOMS — *Pangborn Corp, Hagerstown, Md.* 12-page bulletin 805 illustrates and describes pushbutton-controlled LK and LM table-rooms designed to clean various sized pieces ranging from small parts to castings up to 10 ft wide weighing up to 6 tons. Gives dimensions and specifications of eight models including the new two-table type. Information included on the Rotoblast abrasive impeller, the basic element of Pangborn's airless blast cleaning equipment.

PARTS AND MATERIALS

32 SPHERICAL ROLLER BEARINGS —*Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* 52-page illustrated book 2760 covers new line of highest capacity bearings and pillow blocks. Bearing features include maximum diameter and quantity of convex rollers for each bearing size; precision machined centrifugally cast bronze retainers; and high, heavy inner

(Continued on p 195)

"Settle a bet for us, will you, boss? Did you or did you not smile last Thursday around two o'clock?"



Induction Heating is used to heat all metals, including the new high-temperature alloys and exotic metals, to temperatures ranging from a few hundred degrees to several thousand degrees.

Historically, Induction Heating manufacturers have specialized and have provided a service to specific application areas. This specialization has confined the many advantages of Induction to a few specific fields. Actually, most metalworking operations can be improved by the use of Induction equipment.

By joining the pioneer companies (Ajax Electrothermic, Ajax Engineering and Magnethermic) into one company, we offer a service unavailable before. A single manufacturer of Induction equipment with the background, facilities and product line permits an unbiased evaluation of your heating or melting application.

More A M equipment in use than any other make.

John A. Lyon
President

Induction Heating is our ONLY Business

AJAX Magnethermic CORPORATION

GENERAL OFFICES: Youngstown 1, Ohio

AJAX ELECTROTHERMIC DIVISION
Trenton 5, New Jersey

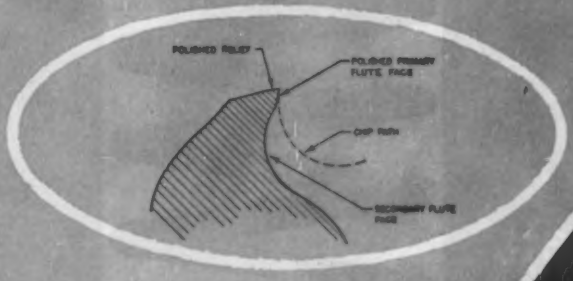
MAGNETHERMIC DIVISION
Youngstown 1, Ohio

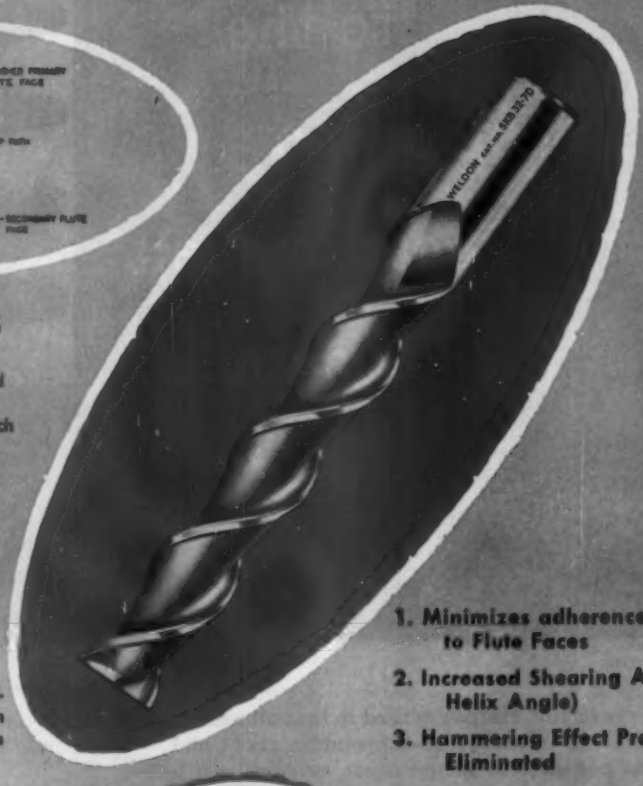
AJAX ENGINEERING DIVISION
Trenton 7, New Jersey

WELDON
Ski-Kut END MILLS

FOR CUTTING ALUMINUM

PATENT APPLIED FOR





CUTTING ALUMINUM MADE EASIER, SMOOTHER AND FASTER

The primary flute face of the Ski-Kut End Mills, being narrow, definitely minimizes adherence of chips to the flute faces. Such adherence or welding of aluminum chips contributes in a major degree to the difficulty in milling aluminum.

Greater feeds, longer tool life, better finish, easier operation of equipment are some of the advantages to be gained by the use of Weldon Ski-Kut End Mills for cutting aluminum.

Weldon SKI-KUT End Mills are available from stock in size from 1/4" to 2" in various lengths. For full information write for folder SKM-1

1. Minimizes adherence of Chips to Flute Faces
2. Increased Shearing Action(45° Helix Angle)
3. Hammering Effect Practically Eliminated
4. Greater Feeds
5. Longer Tool Life
6. Better Finish
7. Easier Operation

A RADICALLY NEW DEVELOPMENT IN END MILL DESIGN FOR CUTTING ALUMINUM THAT SPEEDS PRODUCTION AND REDUCES COST.

OVER 40 YEARS OF LEADERSHIP SINCE 1918

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

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race shoulders. Describes design features; includes comprehensive selection data and formulae; shaft bearing seat diameters; lubrication information; shaft details and bearing load ratings; diagrams and charts.

33 2-WAY VALVES—*Airmatic Valve Inc, 7313 Associate Ave, Cleveland 9, Ohio.* 8-page bulletin 91022 presents detailed description of line of Series 20 for air, oil, water, gas, or chemical. Vacuum is 0 to 30 in. mercury; operating pressure, 0-500 psi; pipe sizes, ¼ to 3 in. Specifications, ordering information, dimensions included.

34 STEEL FORGINGS—*Alco Products Inc, PO Box 1065, Schenectady, NY.* Fall-Winter issue of the Alco Review contains a 5-page article on advantages of the firm's Hi-Qua-Led forgings. Presents physical comparisons of the new free-machining product with regular grade steels of comparable grades. Included is comparative data on yield and tensile strengths, ductility, fatigue strength, and tool wear.

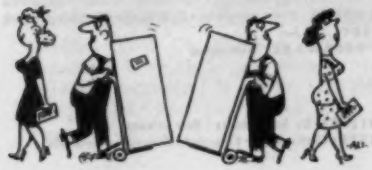
35 SPEED REDUCERS — *Perfection Gear Co, American Stock Gear Division, 152nd St & Vincennes Ave, Harvey, Ill.* 28-page catalog M-140 covers flanged and motorized worm gear reducers. Contains illustrations, charts, and tables on units in nine complete series with ratios ranging from 5:1 to 60:1 in capacities from 1/6 to 5 hp.

36 PLASTIC AND CHEMICAL MATERIALS—*General Electric Co, Chemical Materials Dept, One Plastics Ave, Pittsfield, Mass.* 12-page illustrated brochure CDC-370 gives data on complete line of polycarbonate resins, phenolic resins, varnishes and molding powders, and fused magnesium oxide. Covers product features, special properties, and includes detailed technical data.

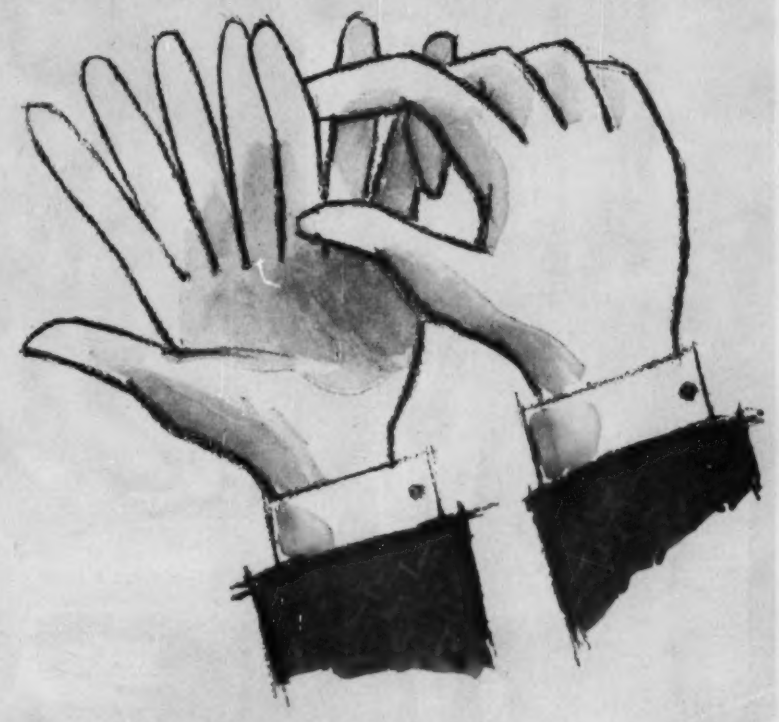
37 MOTOR REDUCERS—*Philadelphia Gear Corp, 3620 G St, Philadelphia 34, Penna.* 28-page catalog MR-58 on vertical Motoreducers and In-line reducers deals with units for use with equipment such as blowers, compressors, conveyors, hoists, cranes, elevators, machine tools. Describes construction and mechanical features of models in eight housing sizes for applications up to 125 hp and output speeds of 9 to 420 rpm. Load characteristics outlined; mounting dimensions and parts lists included.

38 SPEED DRIVES—*General Electric Co Schenectady 5, NY.* 12-page bulletin GEA-6885 gives data on new Kinatrol line of eddy current coupling adjustable speed drives for 5 to 100 hp. Discusses operating principle; covers torque capabilities, regulation and operation of the entire packaged drive which includes the main drive unit, control enclosure, and operator's control.

● CUSTOM MOLDED PLASTICS — *Chicago Molded Products Corp, 1020 N Kolmar Ave, Chicago 51, Ill.* 8-page brochure presents a value analysis approach to the design and purchase of plastic parts and components. Case histories of parts molded by CMPC included. Request direct on company letterhead.



Tired of counting the excess?



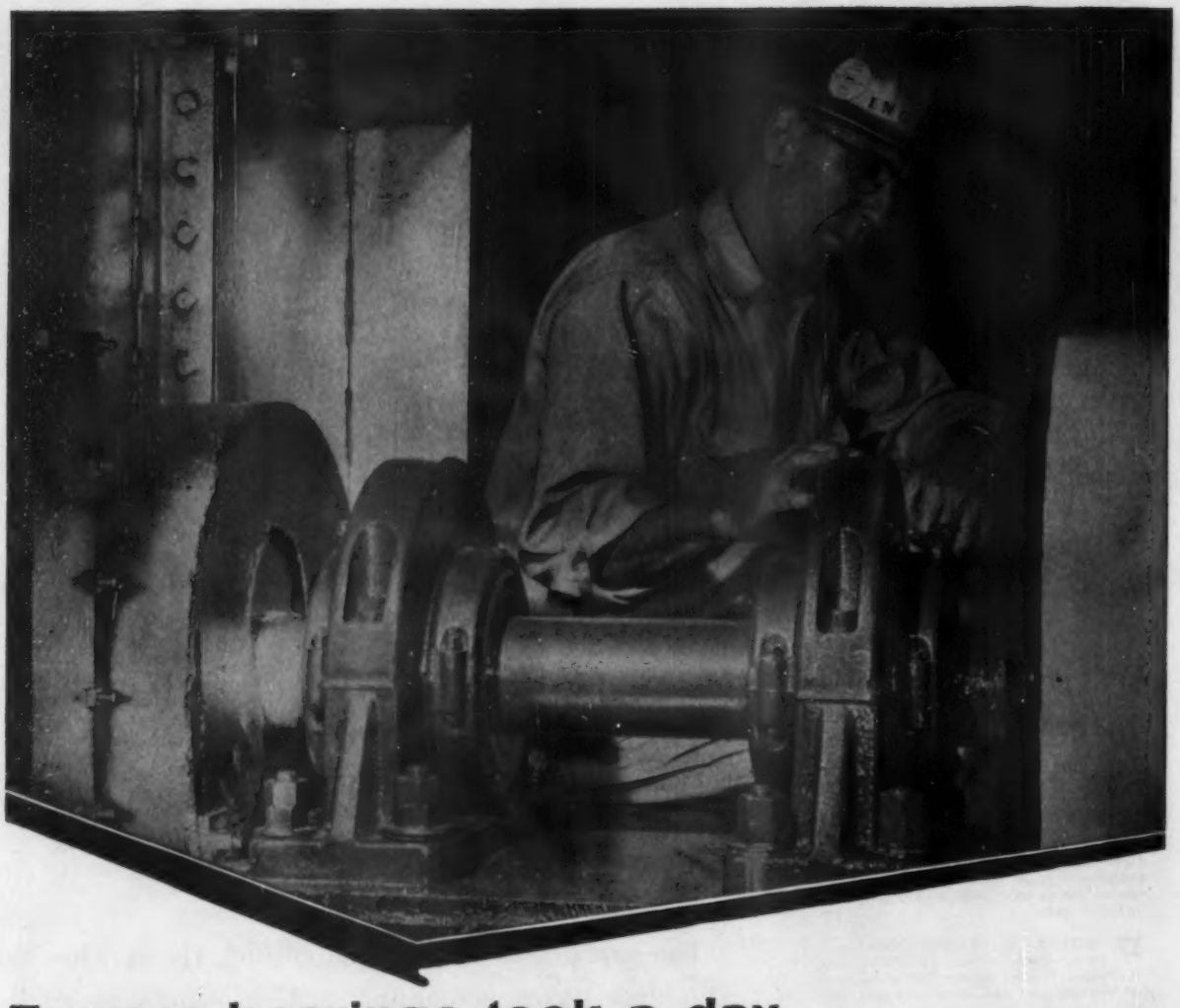
You save seven ways by using Wheelock-Lovejoy's *local* alloy steel warehouse facilities.

The usual costs of handling, cutting, storage, insurance, taxes, accounting, and—in some cases—obsolescence, are *all* eliminated when you order from your local Wheelock-Lovejoy Service Center. You can order your alloy steel—*as you need it*—in any size, shape or grade. See the listing below for the W-L Branch nearest you.

W-L STEEL SERVICE CENTERS—Cambridge
Cleveland • Chicago • Hillside, N. J.
Detroit • Buffalo • Cincinnati

AGENTS—Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.
136 Sidney St., Cambridge 39, Mass.



Former bearings took a day . . . this bearing replaced in 1 hour and a half!

Here is one of several 4-7/16" shaft size split roller bearing pillow blocks installed on large, high speed fans at the Kaiser Aluminum & Chemical plant in Baton Rouge, Louisiana. Split roller bearings were purchased by Kaiser after thorough study and on the recommendation of our sales engineers! Our recommendation was based on the ability of these bearings to stand up under constant use and because it is split right-down-to-the-shaft, removal is both simple and fast.

Shown above is Maintenance General Foreman, Ivy Ingram, with the bearing his crew replaced in only one hour and a half. It formerly took many more hours to pull the sheave or coupling, pull the bearing, dress the shaft and install a new bearing. With this new split bearing, they simply removed six cap bolts and went to work.

We are authorized distributors for all the bearings we sell. They come to you in the manufacturers' boxes guaranteed by the maker and our company. Ask for our recommendation on all bearing requirements–There's a branch near you giving fast service 24 hours a day!

Providing bearing service in the North

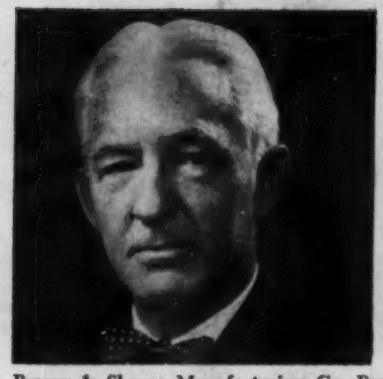
BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Painesville • Toledo • Youngstown Zanesville • **INDIANA:** Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York **WEST VIRGINIA:** Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden **NEW YORK:** Bolanrol Corp., Buffalo • Niagara Falls • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and in the South

DIXIE BEARINGS, INC.

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans **N. CAROLINA:** Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville **VIRGINIA:** Norfolk • Richmond



Brown & Sharpe Manufacturing Co, Providence, RI, has named **Harold B Schott** (left) to the newly created post of assistant to the president, sales. **Joseph E Kochhan** has been named to Mr Schott's former post of general sales manager of the Industrial Products Division. He was previously assistant general sales manager of the division

Minetti Machinery Co, San Francisco, has been formed by **Al Minetti,** former vice president of Harron, Rickard & McCone Co of Northern California. The new machine tool distributing company will serve the Northern California area. In 1957 Mr Minetti served in Washington as consultant to the Metalworking Equipment Div of the Business and Defense Services Administration, Dept of Commerce.

NAMES IN THE NEWS...

Hercules Motors Corp, Canton, Ohio, has elected **Adolph A Karrasch** vice president, manufacturing. He moves up from the post of director of manufacturing.

Douglas Aircraft Co, Santa Monica, Calif, has appointed **Kenneth G Farrar** vice president, manufacturing, to succeed **Frederick W Conant** who has retired. Mr Farrar has been general manager of the company's Long Beach Division since 1953 and a vice president of the firm since 1954.

Master Power Corp, Bedford, Ohio, subsidiary of Black & Decker Mfg Co, has appointed **William S Brucker** engineering manager. He was formerly chief development engineer at Black & Decker.

Detroit Controls Division of American-Standard has named **Richard L Campbell** and **George F Butterfield** vice presidents. Mr Campbell is director of engineering and Mr Butterfield general manager of manufacturing. They will continue to supervise these activities.

Lionel Corp, Chicago, has appointed **Henry C Van Deventer** director of manufacturing. He was formerly production manager of Danly Machine Specialists.

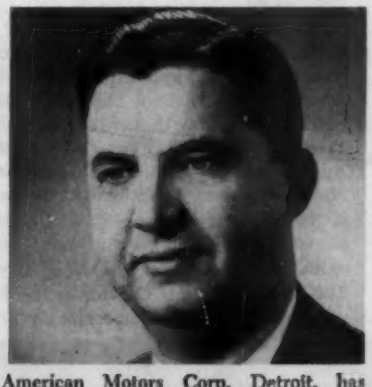
Selas Corp of America, Dresher, Penna, has named **Robert E Greiss** production manager of all manufacturing and assembly departments. **Albert W Kiesel** has been made superintendent of manufacturing.

Crown Cork & Seal Co, Philadelphia, has appointed **Zane B Laycock** manager of sales for the Machinery Division. He was previously manager of industrial machine sales.

Erie Foundry Co, Erie, Penna, manufacturer of forging hammers and presses, has named **Russell O Newton** sales manager in charge of administration of all Erie products. He was formerly associated with Brown & Sharpe Mfg Co as district sales manager for industrial products, New England area.

Robertshaw-Fulton Controls Co has elected **Charles A Bogenrief** vice president, manufacturing, for the Richmond (Va) based company. He was previously director of facilities.

Weldon Tool Co, Cleveland, has appointed **S E Smith Jr** general sales manager. He succeeds **J H Devlin,** vice president, sales, who has retired after 22 years of service



American Motors Corp, Detroit, has named **Joseph W Mueller** manager of manufacturing of the Automotive Division. **Donald H Monson** succeeds Mr Mueller as works manager of the company's main plant at Kenosha

Timken Roller Bearing Co, Canton, Ohio, has appointed **R L Frederick** executive director, International Division. He was formerly assistant to the president of the company

NEW

AN EXCEPTIONAL DEVELOPMENT IN THE COMPOUNDING OF RUBBER CUSHIONED ABRASIVES

Semi-Firm Binder
Brightboy GB

New GB

rounds out the Brightboy line—the only complete, comprehensive STOCK line of multi-use soft rubber bonded abrasives which brings you a revolutionary concept of finishing; *time saving operations not previously associated with abrasive uses.*

BENEFIT FROM BRIGHTBOY'S 49 STOCK COMPOUNDS

4 basic binders: ST, Soft; GB, Semi Firm; BL, Firm; TT, Tough. *6 grain sizes* from extra coarse to extra fine, *2 grain types,* Silicon Carbide and Aluminum Oxide. And Fine-Tex, compounded with pumice abrasive.

WRITE TODAY FOR DETAILED INFORMATION AND APPLICATION SUGGESTIONS

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N. J.

America's Pioneer Manufacturer of Rubber Bonded Abrasives

WELDON ROBERTS
Brightboy
RUBBER CUSHIONED ABRASIVES

NAMES IN THE NEWS...

Industrial Heating Equipment Association Inc has elected the following officers for 1960: **W E Benninghoff,** vice president and Tocco Division general manager of the Ohio Crankshaft Co, Cleveland, is new president of the Association; **H J Pugsley,** senior vice president, Swindell-Dressler Corp, Pittsburgh, has been named vice president. **Robert E Fleming** has been re-elected executive vice president of IHEA.

Great Eastern Mfg Co, Springfield, Vt, has elected **Herbert C Polidor** president of the company which manufactures precision gears. He was formerly vice president of the firm. **W C Rickerson** has been named chairman of the board.

Airborne Instruments Laboratory, Long Island, NY, has appointed **Dr E G Fubini** and **Dr G C Comstock** vice presidents. Both of the men were co-directors of AIL's Research and Engineering Division. Dr Fubini is now in charge of research and systems engineering and Dr Comstock will supervise the Electronic Systems and Techniques Division.

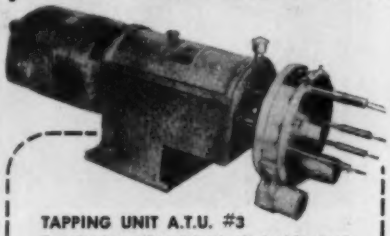
Arwood Corp, New York (merged Arwood Precision Casting Corp, Mercast Manufacturing Corp, and Alloy Precision Casting Co) has named **Rawson L Wood,** founder and former president of Arwood Precision Casting, board chairman of the new corporation. **William I Matthes,** former APC executive vice president, has been elected president, and **William O Sweeny,** APC vice president, sales, has been appointed executive vice president of the new company.

Brown & Sharpe Mfg Co, Providence, RI, has appointed **Henry A Szostek** Cutting Tool Division manager for the north central district; **Gottlieb R Mohn** manager for the midwest district; and **Jack Petersen** sales manager for the west coast district.

Air Reduction Sales Co, New York, has appointed **C H Glasier** executive vice president. He was formerly vice president, gases.

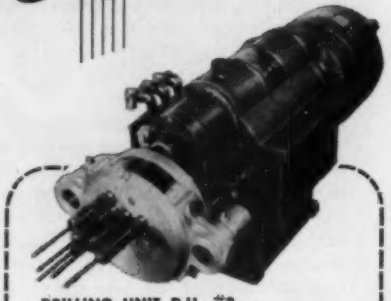
Midvale-Heppenstall Co, Philadelphia, has appointed **Howard C Myers Jr** director of metallurgy. He was previously general superintendent of testing and inspection.

The Tap and Drill Team for your hole production...



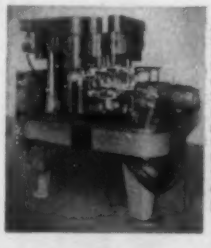
TAPPING UNIT A.T.U. #3
Completely self-contained all-electric lead screw precision unit. Quickly interchangeable for fast single or multiple spindle head operation. With forward and reverse electromagnetic clutches and variable torque control.

Ettco-Emrick **TAP & DRILL TWINS**



DRILLING UNIT D.U. #2
Completely self-contained precision unit with powerful air feed and hydraulic control. Quickly interchangeable for fast single or multiple spindle head operation.

Used singly or in combination they offer the flexibility and adaptability to meet modern drilling and tapping requirements. When combined with Ettco-Emrick multiple spindle heads they'll set new standards of precision, speed and economy.



SPECIAL MACHINES
Building the Twins into high production special machines is simple, because all units are electrically controlled and all components are standardized equipment. We can supply the assembly complete with tooling — or you can do it in your own plant.

Write for details

Authorized distributors in U.S. and Canada

ETTCO TOOL & MACHINE CO., INC.
590 Johnson Avenue, Brooklyn 37, N. Y.
Chicago • Detroit • Los Angeles • Indianapolis

The only full line manufacturer covering the entire small hole field: Tapping Attachments • Multiple Heads • Drilling & Tapping Units and Machines • Special Machines • Indexing Fixtures • Tap & Drill Chucks

50.7% or 3%?

When a Company "Sees" the Facts on Eye Protection ... Eyes Are Saved and Costs Go Down!

GREIST MANUFACTURING COMPANY, NEW HAVEN, World's Largest Manufacturer of Sewing Machine Attachments, Precision Measuring Instruments, and Fine Quality Metal Stampings, is another company that can prove to you very quickly that eye protection pays off! They state: "The dramatic turning point in our Eye Safety Program occurred shortly after January 1955. Our reportable eye cases fell to a low of 11.1%. This corresponded with a percentage of 38.4% in 1951, 50.7% in 1952, and 39.6% in 1953. In 1956 the percentage dropped to 6%. *In 1957 we had a new low of only 3%. We had 30 reportable cases, of which only one was an eye reportable case.*"

Apart from humanitarian considerations, an eye protection program is amply justified by the money it saves in both direct and hidden costs! Medical and compensation costs alone for the loss of one eye can mount to four and five figures. Hidden costs for the average eye accident are estimated at 4 times the direct costs.

What to do? Install an American Optical Eye Protection Program. It works! Only safety standard lenses and safety standard frames are used. There is no substitute for safety. Write us today or call your nearest AO Safety Representative.

Always insist on ® Trademarked Lenses and Frames

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Branches in Principal Cities

whatever your

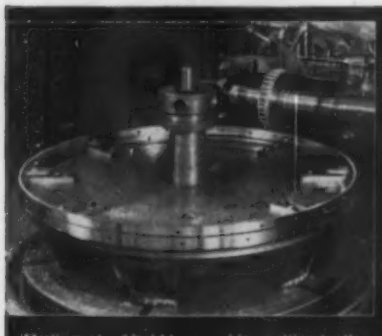
Gear Problem...

it will pay you to bring it to us

• BRAD FOOTE has the finest cutting and shaping equipment available for producing the widest possible variety of precision gears.

• Our heat-treating facilities are second to none. From blanks to the finished precision gears... BRAD FOOTE takes the job all the way. There is no division of responsibility.

• Whatever your gear-cutting needs...racks, speed reducers, transmissions or intricate power units...BRAD FOOTE fills all your requirements from one source. Let our engineers consult on your requirements. There is no obligation. It may save you time and money.



Medium-sized hobbing machine cutting teeth in special crown gears

Special precision 154" gear shaper cutting internal gear for use in large wind tunnel

Large hobbing machine cutting teeth of large pinion on 12 foot shaft

Large special 154" gear shaper cutting large spur internal ring gear for radar equipment

BRAD FOOTE GEAR WORKS, INC.

MEMBER OF AGMA

1301 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

subsidiary • PITTSBURGH GEAR COMPANY, Neville Island • Pittsburgh 25, Pa., Phone: SPaulding 1-4600

NAMES IN THE NEWS...

E W Bliss Co has named **Harry A Skillman** west coast manager of the Press and Die Supply Division, and **Milton J Jefferis** factory manager. Mr Skillman has been a sales engineer for the Division in southern California and Arizona; Mr Jefferis has been manufacturing manager at the San Jose plant.

General Electric has named **Dr John G Hutton** general manager of the Specialty Control Department, Waynesboro, Va. Formerly manager of electrical engineering for the company's General Engineering Laboratory at Schenectady, he succeeds **Dr L T Rader** who has resigned.

Eaton Manufacturing Co, Cleveland, has elected **E M deWindt** vice president and director of sales. Formerly assistant director of sales, he succeeds **Ralph E Fisher** who has retired. **George H Acker,** president of Cleveland Worm & Gear Co (Eaton subsidiary) and its subsidiary, Farval Corp, has been named general manager of both, now made divisions of Eaton.

Carborundum Co, Niagara Falls, NY, has elected **John F Claydon** vice president. He has seen service as general manager of the Coated Abrasives Division.

John D Dewhurst, president of **Arrow Tool Co,** Wethersfield, Conn, and secretary of the National Tool & Die Manufacturers Association, has been appointed for a two-year term to the Federal Committee on Apprenticeship.

Smith-Corona Marchant Inc, Oakland, Calif, has promoted **Ward J Koepenick** from national sales manager to general sales manger of the Marchant Division.

Heli-Coil Corp, Danbury, Conn, has appointed **John Fasano** and **David B Morgan Jr** vice presidents. Mr Fasano was formerly sales manager and Mr Morgan director of industrial and public relations.

Textron Inc has named **C R Eisenschmidt Jr** president of the recently acquired **Amsler Morton Co,** Pittsburgh industrial furnace manufacturer. Mr Eisenschmidt was formerly manager of the Nuclear Core Department at Westinghouse Electric Corp's Bettis Atomic Power Division.

Atrax

Precision Ground
SOLID CARBIDE
TOOLS AND BURS

Job Applications

NEW ATRAX DIA-MO CUT IMPROVES BUR PERFORMANCE ON STAINLESS AND HEAT TREATED ALLOYS

A new type of cut that produces a tooth form with three cutting edges on each tooth has many advantages over conventional Diamond Cut burs.

EXCLUSIVE ATRAX DESIGN

By carefully controlling depth of flute, both left and right, and by engineering a definite ratio between the number of left and right flutes, a revolutionary bur cutting action results.

3 CUTTING EDGES

The chisel shaped tooth with three cutting edges produces a flake-like chip instead of the hard-to-control sliver-like chips produced by cuts ordinarily supplied on burs and the gritty, abrasive chips formed with the pyramidal type tooth on most Diamond Cut burs.

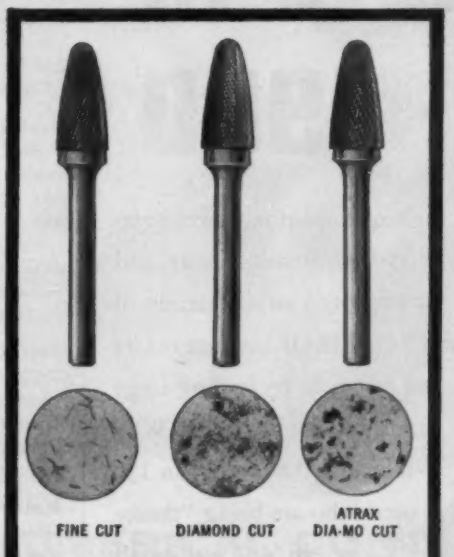
NOTE three cutting edges take shearing-type cuts producing smooth surface finish.

SUPERIOR TO DIAMOND CUT

Instead of the wearing grinding action of Diamond Cut burs, the new Atrax Dia-Mo Cut actually cuts small chips similar to those produced by peripheral end milling.

LONGER TOOL LIFE

Cutting action is faster and more positive and tool life is appreciably longer. This new type of cut has been shop tested and is recommended for cutting the toughest heat treated alloys and stainless steels. With the Dia-Mo Cut, "Bur-climb" is practically eliminated.



Fine Cut bur (left) produces long sliver-like chips. Diamond Cut bur (center) produces sharp, abrasive chips. Atrax Dia-Mo Cut (right) produces flake-like chips—gives faster, smoother cutting action.

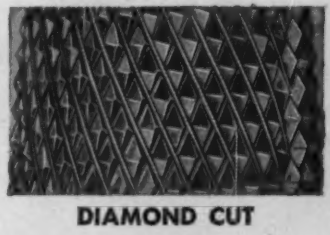
FASTER PRODUCTION

In extensive shop tests, increased burring production is possible because of faster stock removal and reduced operator fatigue.

DIRECTION OF CUT

DIA-MO CUT

DIRECTION OF CUT



DIAMOND CUT

IMPROVED SURFACE FINISH

Surface finish after burring with the new Atrax Dia-Mo Cut is superior to that produced by a Diamond Cut bur making subsequent finishing, grinding and polishing operations much easier.

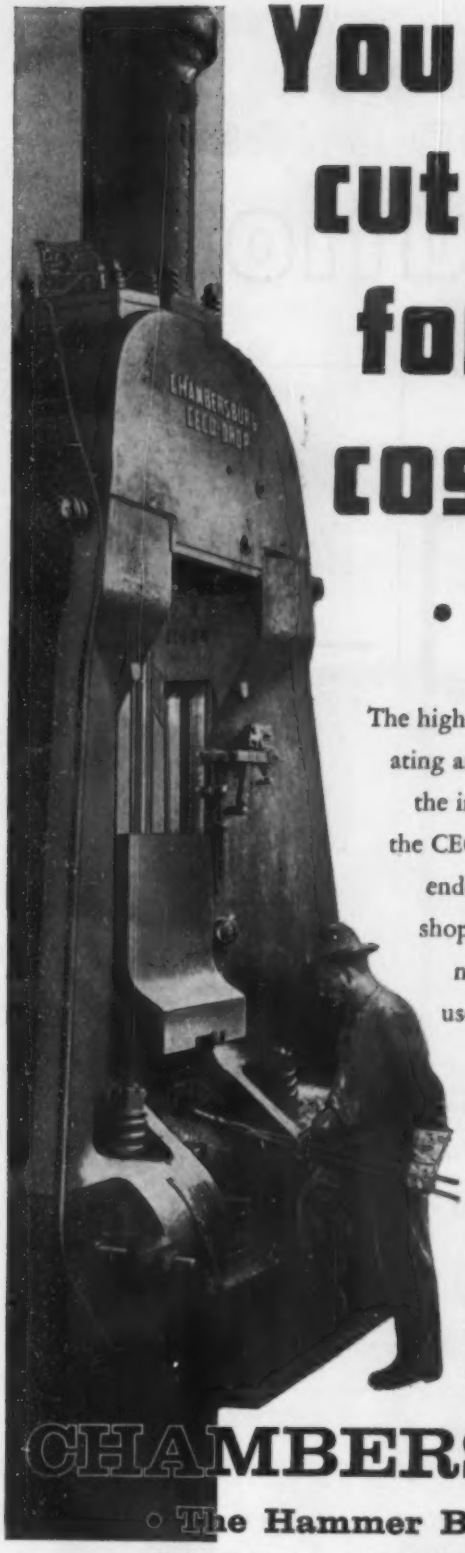
It is recommended that the new Dia-Mo Cut be operated at 1/3 to 1/2 the speed of conventional burs for most efficient cutting action and uniform surfaces.

The new Atrax Dia-Mo Cut is available on request on 615 different bur sizes and types in standard, fine and coarse cuts.

We feel that this information can help you improve production, lower costs and discover the superiority of Atrax Solid Carbide Tools and Burs.

SEND FOR 148 PAGE "STANDARD REFERENCE" ON SOLID CARBIDE TOOLS . . .

TO: THE ATRAX COMPANY
240 DAY STREET, NEWINGTON 11, CONNECTICUT



You can cut your forging costs in • 1960

The higher production, lower operating and maintenance costs, and the improved safety features of the CECO-DROP account for its endorsement by leading forge shops all over the world. Why not join the more than 130 users who are being "thrifty in '60" and install Ceco-Drops in *your* shop.

Send for the 28-page bulletin, "The Ceco-Drop and its place in Forge Shop Modernization." Write today.

•

CHAMBERSBURG ENGINEERING CO.
Chambersburg, Penna.

CHAMBERSBURG
• The Hammer Builders •
DESIGNERS AND MANUFACTURERS OF THE IMPACTER

When it's a vital part, design it to be FORGED

NAMES IN THE NEWS...

Cameron Iron Works Inc, Houston, Texas, has elected **A D Blackledge** vice president and assistant manager; **W R Davis** vice president and manager of the Pressure Control Equipment Division; and **J W Brougher** vice president and manager of the Special Products Division which includes steel making, press and hammer forging, and finished parts and assemblies for general distribution.

Ampex Data Products Co, Redwood City, Calif, has appointed **Paul J Weber** manager of the Instrumentation Products Division and **James D Bowles** head of the Computer Products Division. Mr Weber was previously marketing manager for his division and Mr Bowles manager of Instrumentation's Carmel Project.

Taylor Fibre Co, Norristown, Penna, manufacturer and fabricator of laminated plastics and vulcanized fiber, has appointed **James J Kelly** assistant to the vice president, manufacturing. **Joseph J Shanda,** formerly assistant plant engineer at Precision Grinding Wheel Co, Philadelphia, succeeds Mr Kelly as plant engineer.

Bell & Gossett Co, Morton Grove, Ill, producer of pumps and heat exchangers, has appointed **Louis S Oosten** vice president, engineering. Formerly plant superintendent, he succeeds the late **Harold A Lockhart.**

Kaiser Industries Corp, Oakland, Calif, has elected **Nils O Eklund Jr** a vice president. He will serve as assistant to Henry J Kaiser Jr, officer and director of the concern and other affiliated Kaiser companies.

OBITUARIES

John Verson who, with his brother David, founded the **Verson Allsteel Press Co,** Chicago, died Jan 8 in Florida. Mr Verson was senior vice president of the company and also president of Verson Manufacturing Co, Dallas, Texas.

Austin C Ross, 66, formerly vice president of **Worthington Corp,** Harrison, NJ, died Jan 8 in Buffalo. Mr Ross had retired from the company in 1958.

John C Pangborn, 75, co-founder of **Pangborn Corp,** Hagerstown, Md, died Dec 24. Mr Pangborn, with his brother Thomas, founded the blast cleaning and dust control manufacturing concern in 1904.

FOR NUMERICAL CONTROL AT LOWEST COST

Illustrated here is a Gorton Mastermil with O-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

GORTON NUMERICAL CONTROL

is field tested and proved in use

This is how Gorton Numerical Control saves you money on short runs:

- — eliminates elaborate and costly tools, dies, jigs and fixtures
- — wastes no time because operator does not "pace" the work
- — makes no mistakes because operator skill not required
- — extreme, repetitive accuracy is easy and automatic
- — change overs in set-ups can be made quickly
- — signals operator when tool changes are needed
- — guides cutter in close quarters without damage to work or cutter
- — making punched tape is simple typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of Gorton Numerical Control and how much more it gives you for your money. For full information write

Saves You Money on —

- face milling
- side milling
- end milling
- straight line cavity milling
- slotting
- drilling
- reaming and boring

Your letterhead inquiry will receive prompt attention.

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1502 Racine St., Racine, Wisconsin

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

IN EVERY IMPORTANT INDUSTRIAL CENTER

There's a

WYCKOFF

SALES and SERVICE OFFICE

READY TO SERVE YOU

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A. W. Eastin—*Phone:* Empire 5-2388
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C. B. Thoburn—*Phone:* Main 1-8662
DAYTON, OHIO
G. H. Rehling—*Phone:* BA 3-6571
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DETROIT, MICH.
E. C. Koester—*Phone:* Trinity 2-2002
FARGO, N. D.
Steel Structures Equipment Co.
Phone: AD 2-6493
FORT WORTH, TEXAS
C. A. Fischer—*Phone:* Edison 2-6402 or 2-5435
GREENSBORO, N. C.
K. O. Brown & Co.—*Phone:* Broadway 3-5973
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Lane Johnston
Phone: (Putnam) Walnut 8-2754
HOUSTON, TEXAS
Harry W. Renick, Jr.—*Phone:* Jackson 4-8294
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NEW BOOKS...

HISTORY OF THE GRINDING MACHINE —*By Robert S Woodbury. Published by The Technology Press, Massachusetts Institute of Technology, Cambridge 39, Mass. 191 pages, paper cover. Price $3.50*

Grinding may well be the first of the cutting processes to be employed by man (sandstone or emery would cut a hole in and sharpen a stone into an axe), but it was one of the last to be adapted to machine tools.

Despite the sketches of Leonardo da Vinci, grinding didn't move out of the "grindstone phase" into a machine tool until about 1830. It didn't become a precision process until Joseph R Brown got hold of it and all the necessary elements were incorporated in his design of 1868. It remained for Charles Norton to make a production machine out of it.

"The development of the grinding machine as a production tool in industry . . . illustrates succinctly the dangers of accounting for economic and social change without considering carefully and in some detail the technological basis which is a necessary condition of industrialization. Of the various technological advances which made our industrial society possible, that most neglected by economic and business historians, yet the one which is frequently crucial, is the machine tool. Without the grinding machine, three important American industries would not have been possible—the sewing machine, the bicycle, and the automobile."

In this second monograph in his series that will eventually lead to a history of machine tools, Robert Woodbury does for the grinder what he has already done for the gear cutting machine (*AM*—Jan 25 '60, p 258). His story concentrates on the machines and there is little space devoted to the personal characteristics of the people involved. Yet you will find here in fascinating detail the battle between Charles Norton and Richmond Viall.

The meticulous research and documentation of the book do not mar its readability for the casual reader. This volume augments the impression of a quality job created by the first monograph and raises our interest for the next.

This reviewer is a bit late with this suggestion—but either of Woodbury's monographs would be a fine gift for anyone with a real interest in metal cutting.—AA

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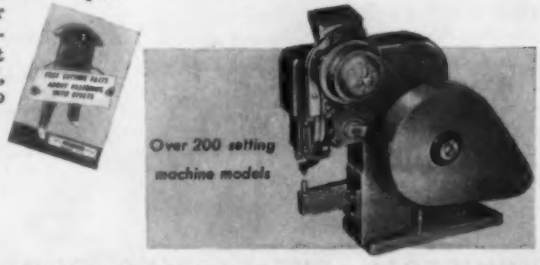

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Without coolant, this Bullard lathe makes a .125 rough cut and .050 finish cut using Kennametal Grade K6 inserts in a Kendex* (patented) holder. Sand holes in the castings add to the difficulty of an interrupted cut. Photos and production data courtesy of American Coleman Company, Littleton, Colorado, manufacturers of trucks, tractors, front drive axles, and related parts.

	50 RPM 24 Minute Tool Life	88 RPM 15½ Minute Tool Life
Feed	.027	.027
Cutting Time:		
First side—rough cut	7 minutes	4½ minutes
First side—finish cut	7 minutes	4½ minutes
Second side—rough cut	5 minutes	3¼ minutes
Second side—finish cut	5 minutes	3¼ minutes
Total cutting time	24 minutes	15½ minutes
Machine cost per hour	$6.00	$6.00
Tool cost per hour	.075	.27
Machine and Tool cost/8 hours	$48.60	$50.16
Pieces finished per 8 hours	5	9
Cost per piece	$9.72	$5.57

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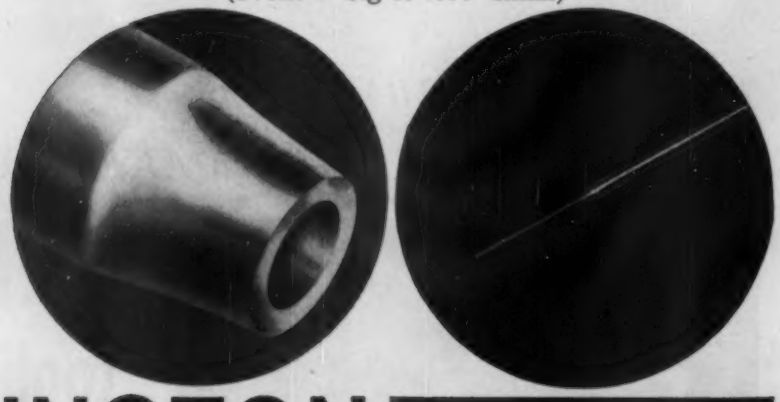

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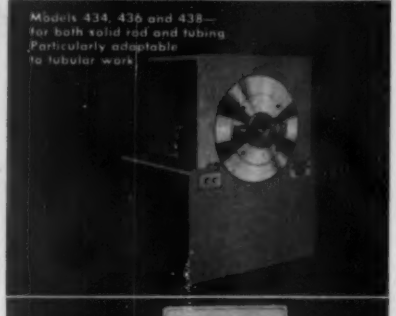

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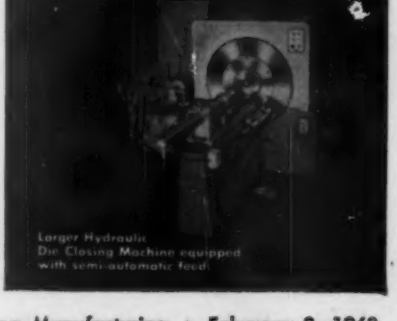

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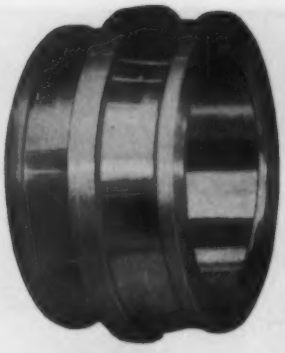
SKF  RACES *Against Time...*

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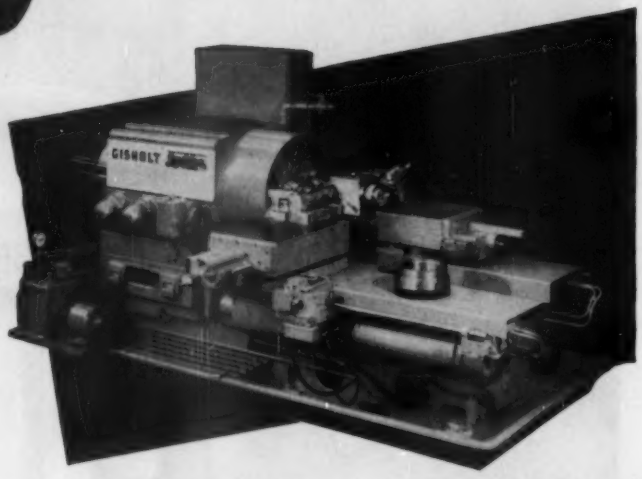
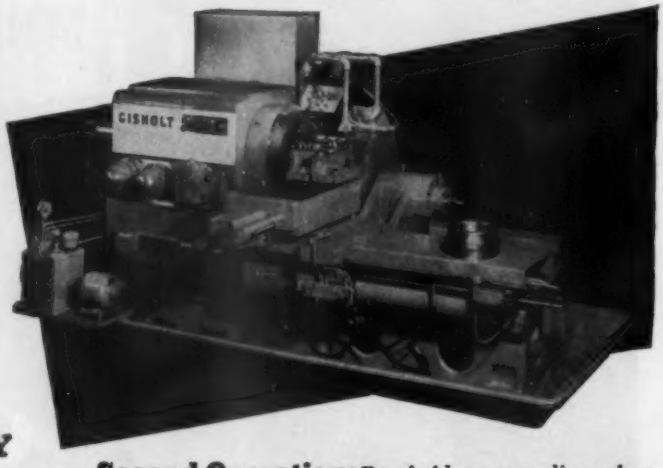


First Operation: Chucked on OD with 3-jaw hydraulic chuck, part is turned up to the jaws, faced, chamfered, bored and bore radius formed. Cam relief on rear tool block turns boring bit clear of workpiece as it is withdrawn.



Second Operation: Part held on expanding arbor by hydraulic pressure is finish turned, faced, chamfered and bore radius formed. Special rocker arm type carriage at rear tips in shaving tools to form both roller grooves with feed of .003" to .0045."

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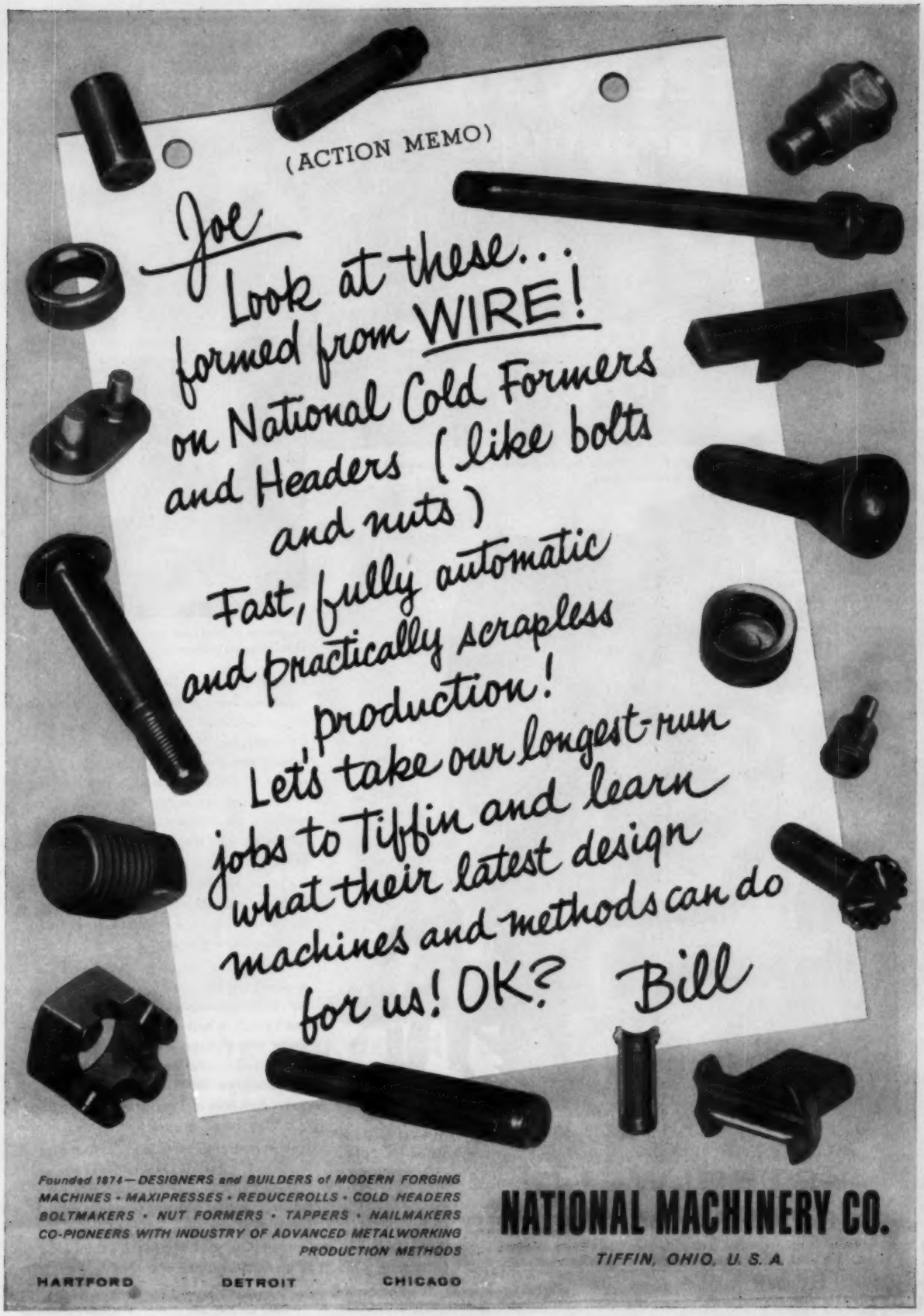

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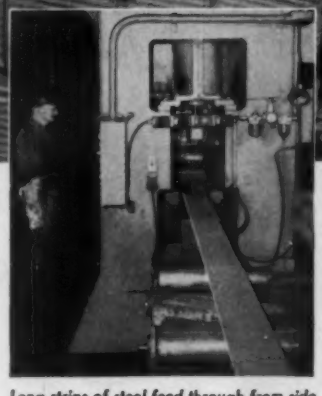
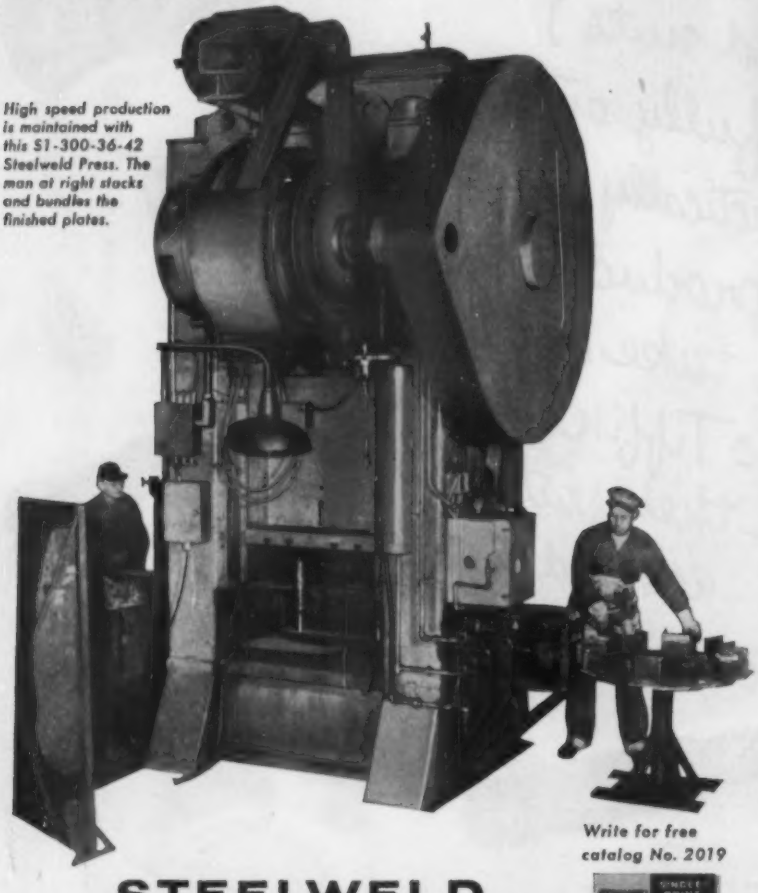
These bundles of finished "West Virginia" brand mine roof bolt washer plates represent little more than an hour's production on the Steelweld Press.



Long strips of steel feed through from side of machine automatically.



High speed production is maintained with this S1-300-36-42 Steelweld Press. The man at right stacks and bundles the finished plates.

A single-point straight-side 300-ton Steelweld Press at the West Virginia Works of Connors Steel Division, H. K. Porter Company, Inc., Huntington, West Virginia, is used exclusively for the production of one item—"West Virginia" brand mine roof bolt washer plates. With an operating speed of 40 strokes per minute, very little time is lost with this machine.

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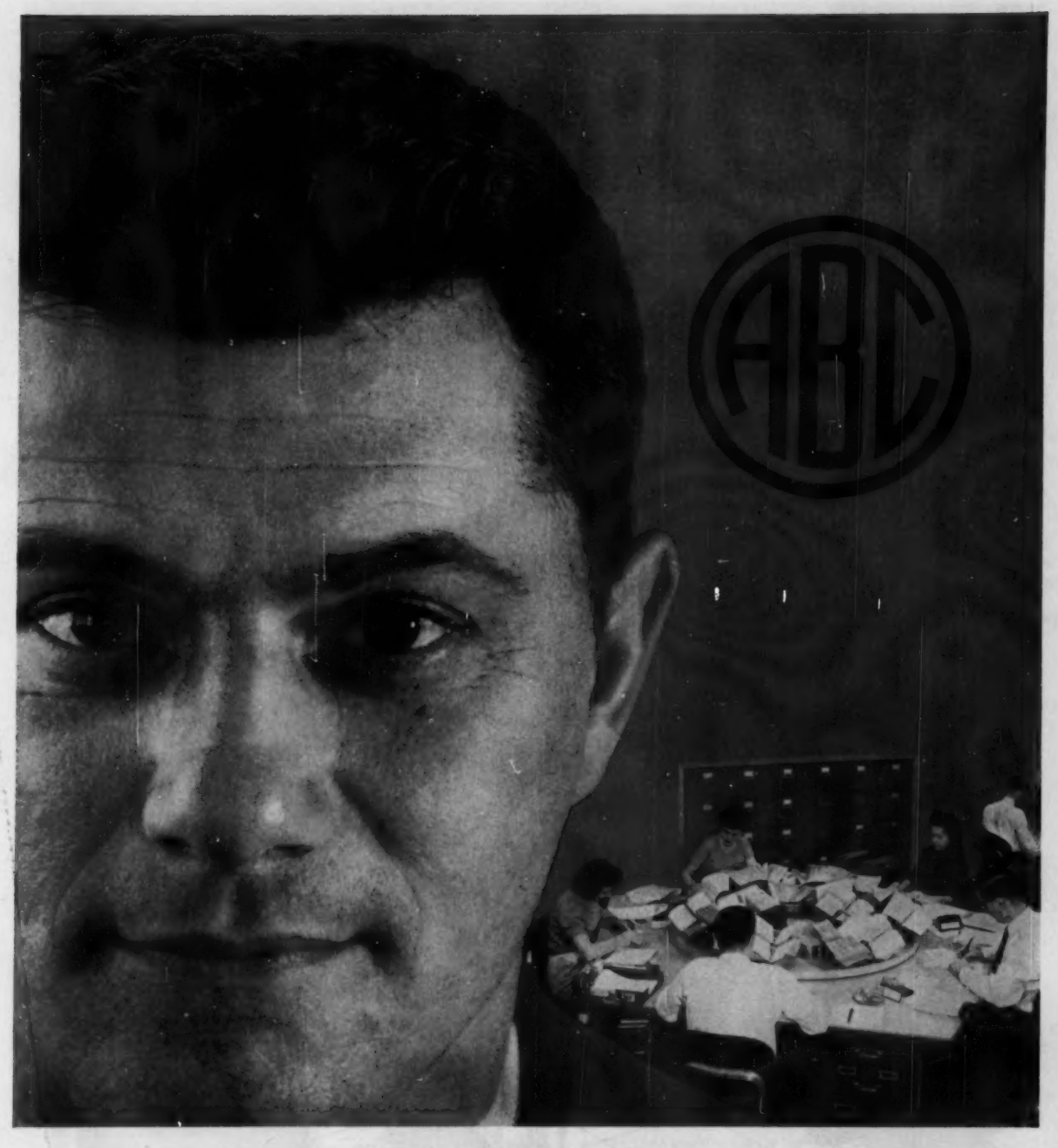

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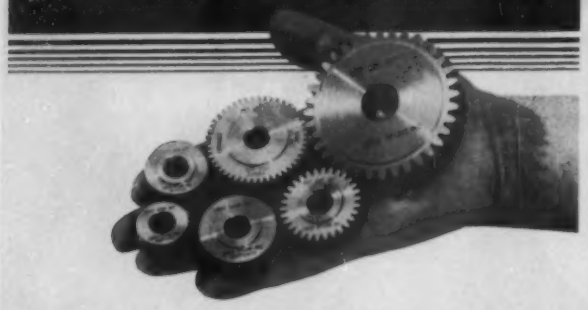

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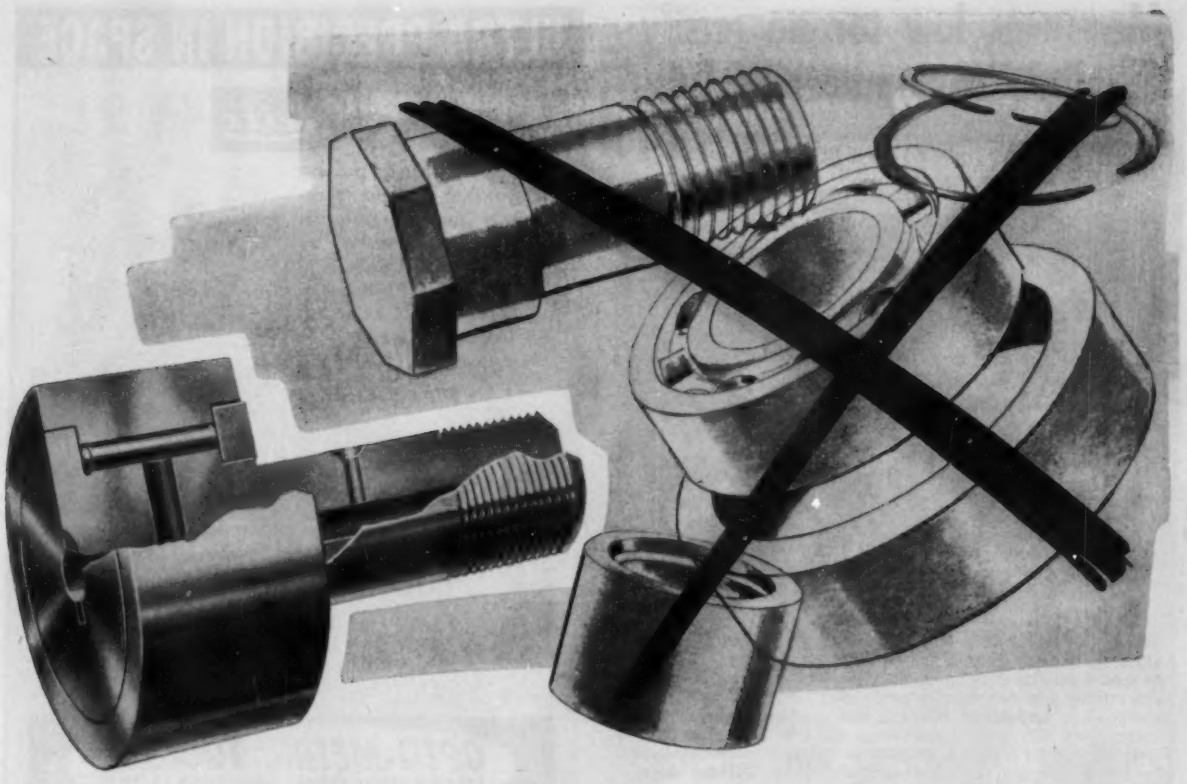

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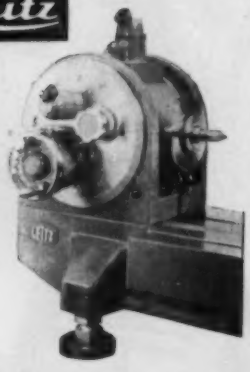

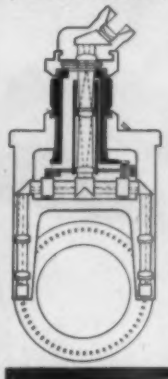

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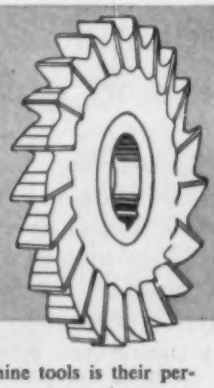

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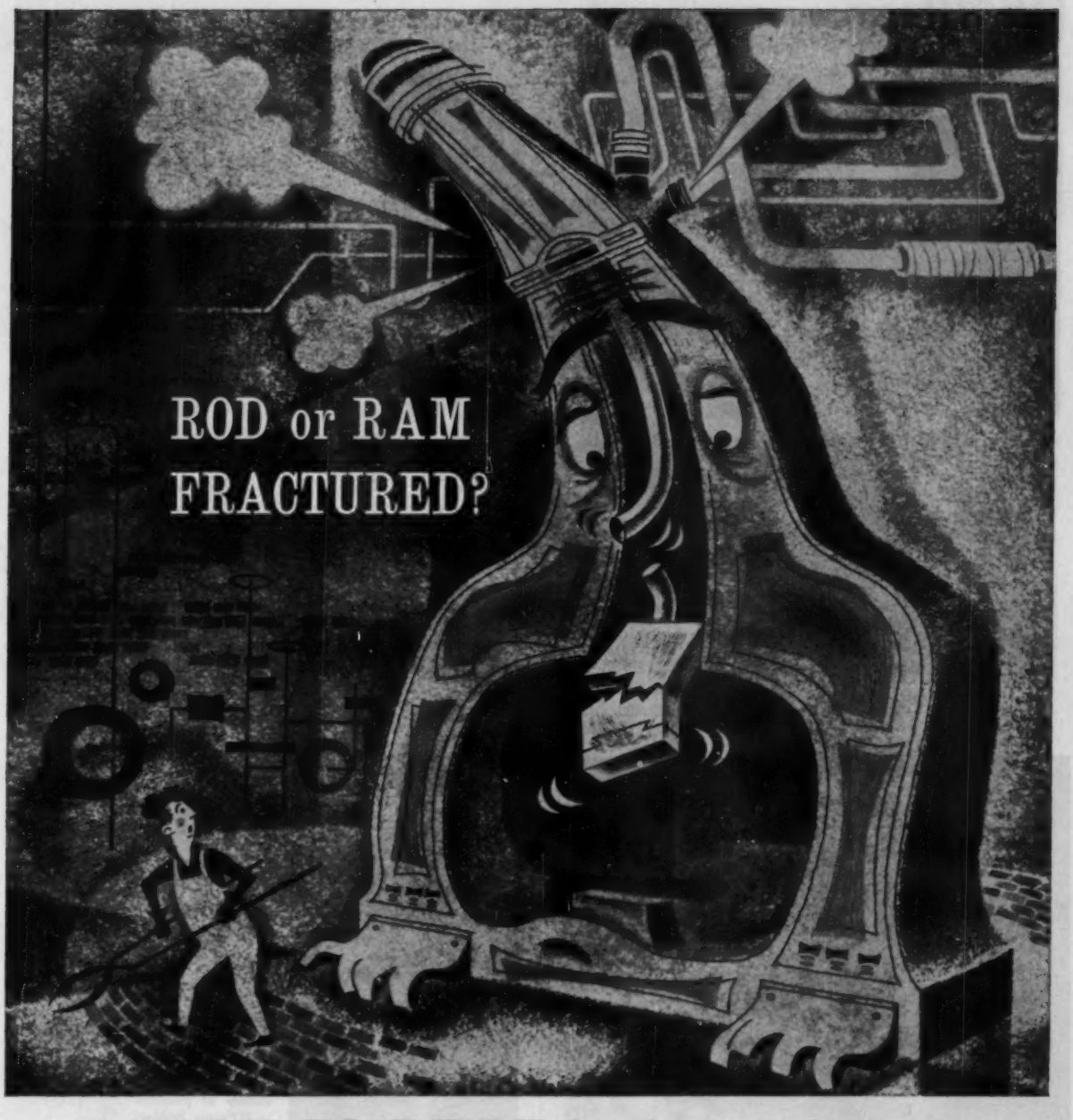

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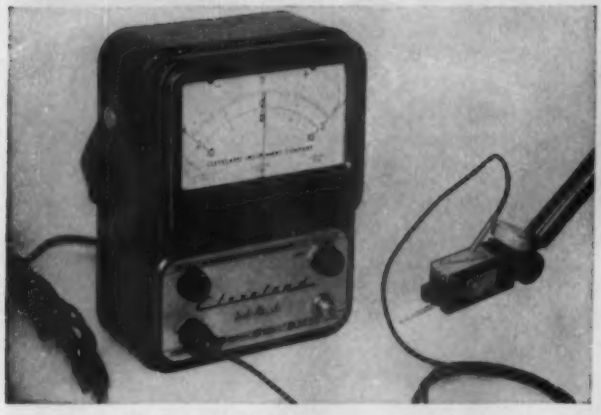

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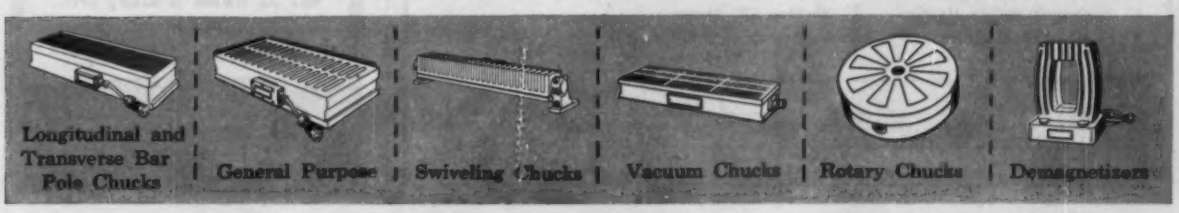

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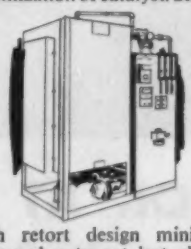

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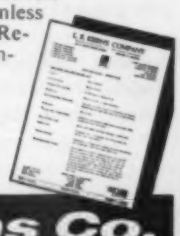

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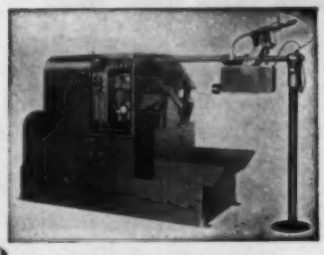

CATALOG

Has complete specifications of all models. Illustrates parts that are being formed, grooved, flanged or chamfered and cut off in a single operation at a high rate of speed. Also describes the automatic feeder, hot spinning machine for sealing ends of tubing, and the Modern Safety Drill Table.

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MODERN MACHINE TOOL CO.
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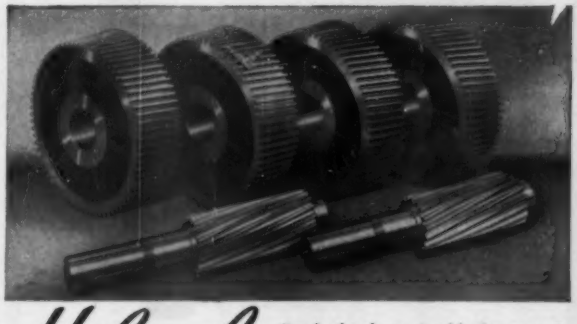

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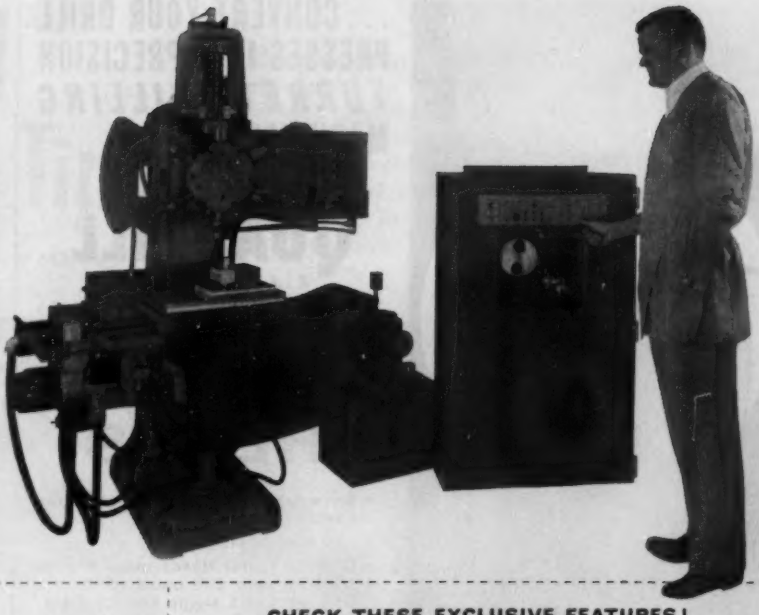
HUGHES 2-AXIS MACHINE TOOL CONTROL



The new Hughes Numerical Control offers you significant savings in tooling and labor costs for all of your high-speed, precision operations—drilling, boring, turning, riveting, spot welding, eyelet inserting, and many others. Easily adaptable to new machines or for retrofit, the Hughes Numerical Control provides you with automatic positioning of a two-axis table, with third axis feed control if desired.

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8. *Fast, easy, low-cost maintenance:* Modular construction with easy-to-replace plug-in units. Uses standard industrial drive motors and clutches; 115v single-phase power.

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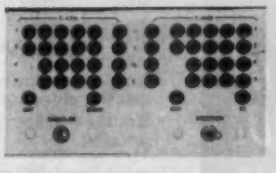

Easier set-up and checking: Display lights on control panel indicate coordinate dimensions to provide operator with means of verifying accuracy of programming.

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Longer tape life: Photo-electric tape reader makes no contact with tape—hence, no possibility of wear or tearing. Unit requires no pneumatic or hydraulic connections.

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INDUSTRIAL SYSTEMS DIVISION

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Practical Tooling Tips

NUMBER 1 OF A SERIES

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SPRING PLUNGERS LET WRENCH DO MULTIPLE DUTY—The compression tool shown above is used to attach connectors to electrical wires. Formerly, each size wire connector required a different size tool. But now, through the use of Vlier Spring Plungers, one tool attaches all sizes of connectors—through the use of changeable jaws. The appropriate jaw for any size connector is easily inserted, accurately positioned, and held in place with a Vlier Spring Plunger.

THE RIGHT AMOUNT OF END PRESSURE AND NO MORE is what this spring plunger application calls for. More than 150 Vlier Spring Plungers are used to hold a plastic sheet in position during the forming operation of a plastic refrigerator door liner. Spring Plungers provide just the right amount of pressure to produce a perfect liner.

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OPERATION SEQUENCE: 1. Probe and stop machine if parts are not drilled through. 2. Locate from drilled hole and clamp. 3. Chamfer left-hand end. 4. Chamfer right-hand end. 5. Turn over 180°. 6. Chamfer left-hand end. 7. Chamfer right-hand end and automatically unload.

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Above, Pines Model 2 Machine producing a continuous series of ells from long stock length. *Left,* tooling for production of illustrated ell. Ells are used as sanitary fittings in the dairy, and related industries.

Here's another illustration of how cold bending the "Pines-Way" can increase output and reduce operating expenses. This Pines Model 2 Machine has enabled Alloy Products Corp., Waukesha, Wisconsin, to produce four times more stainless steel ells and cut scrap losses up to 87% over their previous method. Prior to installation of this machine, short lengths of tubing were filled with lead and bent on a press. From 2" to 3" were trimmed from each bend, and production was 30 ells an hour. Today, these bends in Type 304 stainless are produced in sizes from 1½" to 3" O.D., walls of .050" to .065", at an average of 125 an hour. Scrap loss through material trimmed away has been reduced to ¼" per finished piece.

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The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

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3. Balancing Machines
6. Boring Mills
7. Broaching Machines
9. Centering Machines
10. Chucking Machines
11. Compressors
16. Drilling & Reaming Machines
20. Forging Equipment
23. Gear Cutting Machines
24. Grinding Machines
29. Lathes
33. Milling Machines
37. Planers
40. Press Brakes
41. Presses
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Drills, Vertical: No. 1½⅝ Foote Burt Hydraulic vertical driver for multiple head (2)
Presses, Coining: 250 ton Model 00-250 Minster, 1945-46
400 ton No. 003 Toledo
600 ton No. 004 Toledo tiered frame
Presses Double Crank: 110 ton No. 675B Bliss high speed, high production, s.s. dbl. crank, tiered
Presses, Punching: 90 ton No. 75 Bliss Consolidated herring side flywheel
Presses, Hydraulic: 150 ton Lake Erie, straight side, downward acting, new 1951
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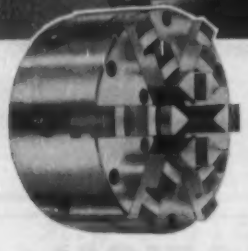

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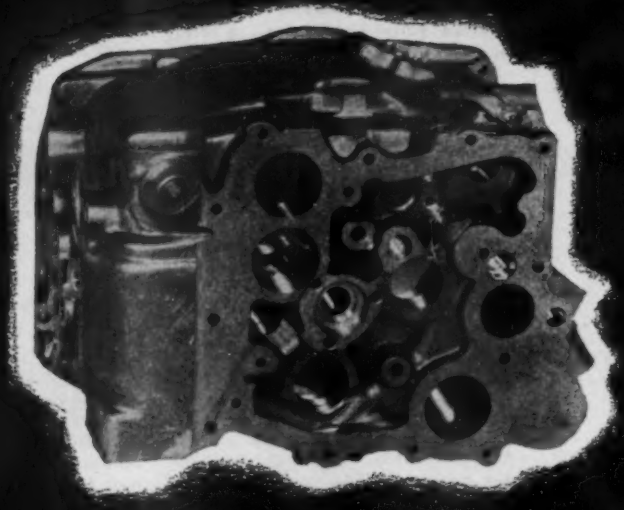

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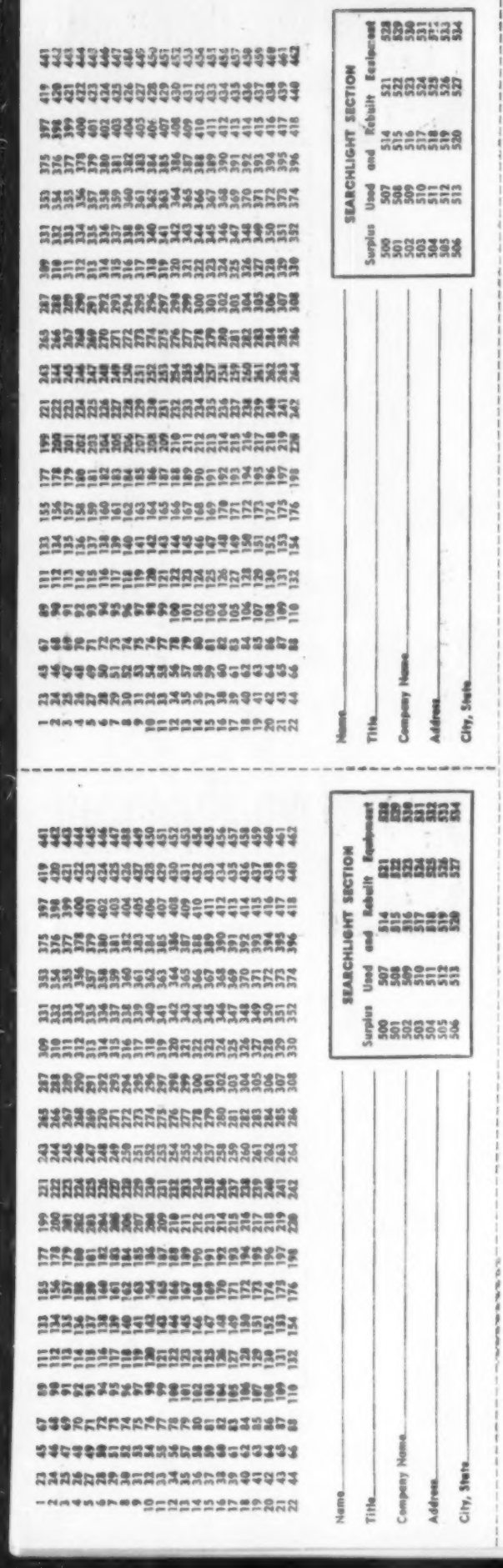

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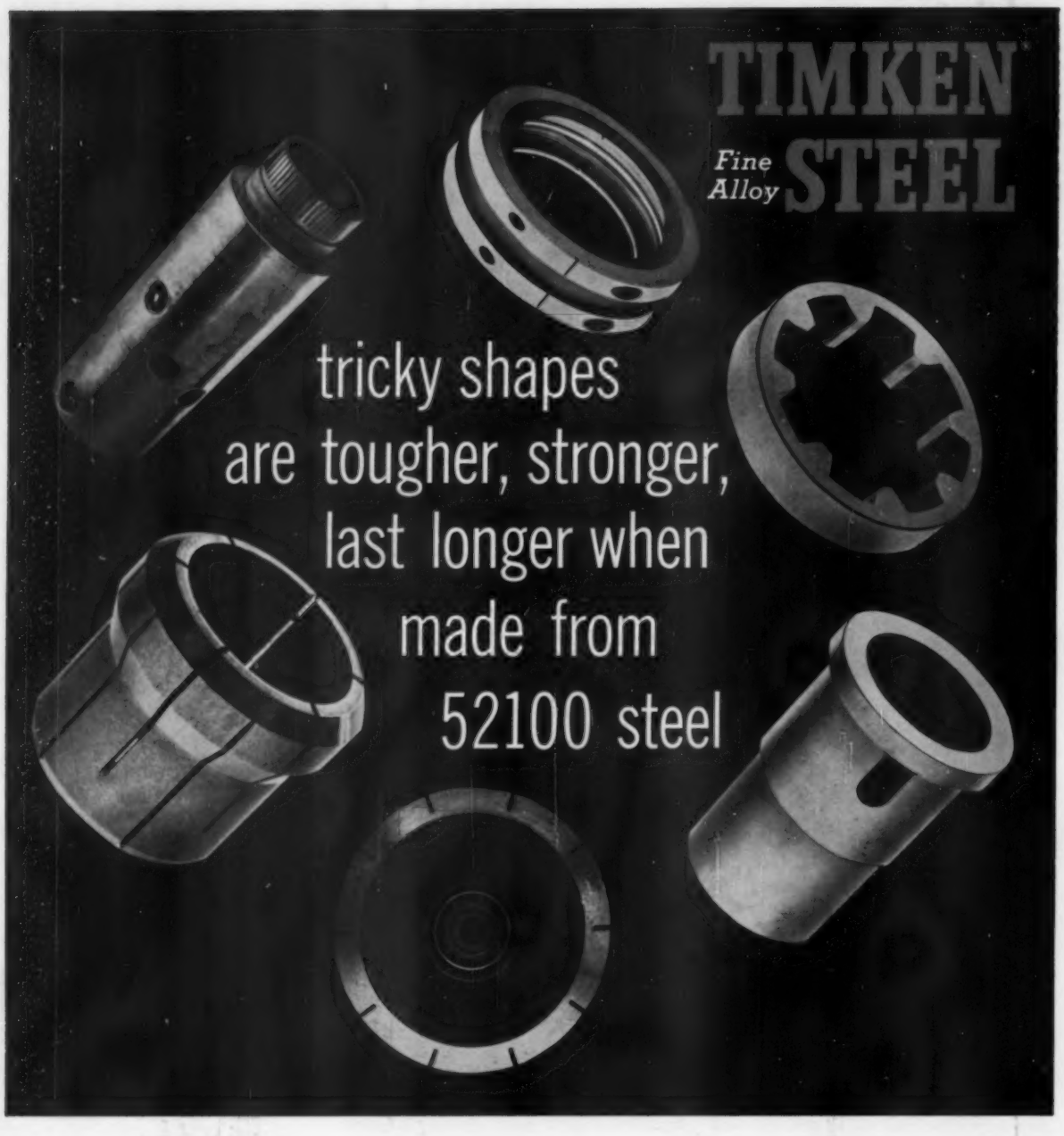

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